The Journal of Occupational Diseases and Traumatic Surgery

Industrial Medicine

for

Physicians and Surgeons in Industry

Volume 9 SEPTEMBER, 1940 Number 9

DEC 18 1940

American Association of Railway Surgeons
Fifty-First Annual Meeting

September 16, 17, and 18, 1940 **Palmer House, Chicago**

"Railroad Surgeons' Records and Reports"
"Fractures of Metacarpals and Phalanges"
"Local Use of Sulfanilamide in Compound Fractures and Other Wounds"
"Chest Injuries"
"Head Injuries"
"Plastic Surgery and Repair"
"Tumors of the Head, Face and Neck"
"The Significance of Hypertension and its Treatment"
"Profits from Poor Results in Fracture Treatment"
"Gas Gangrene, Plea for Better Prophylaxis"
"The Clinical and Physiological Aspects of Human Serum Transfusions"
"The Obstructive Prostate and its Management"
"Gastroscopy as an Aid in the Differential Diagnosis of Gastric Diseases"
"Hernia"
"Occupational Leukoderma"
"Reflex Causes for Anginal Pains"
"Surgical Treatment for Carcinoma"
"Empyema"
"Some End Results After Injuries about the Hip Joint"
"The Problems of the Local Railroad Surgeon"
"Tick Fevers"
"Evolution of Blood Transfusion"
"Value of the Use of Morphine-Scopolamin Anesthesia in First Aid Treatment of the Injured"
"Recent Developments in Gastric Physiology"
"The Diagnosis and Treatment of Neurosurgical Lesions Producing Pain in the Back"
"Conservative Surgery in Hydronephrosis"
"Surgery of the Gastro-intestinal Tract"
"Shock"
"The Recognition and Treatment of Cardiovascular Emergencies"
"The Reduction of Fractures with or without Anesthesia"
"The Aging Process"
"Importance of a Medical Department in Industry"

Annual Banquet - Tuesday, September 17

Speaker—W. M. JEFFERS, President Union Pacific

Subject—"Importance of a Medical Department in Industry

Complete Program on Page 479

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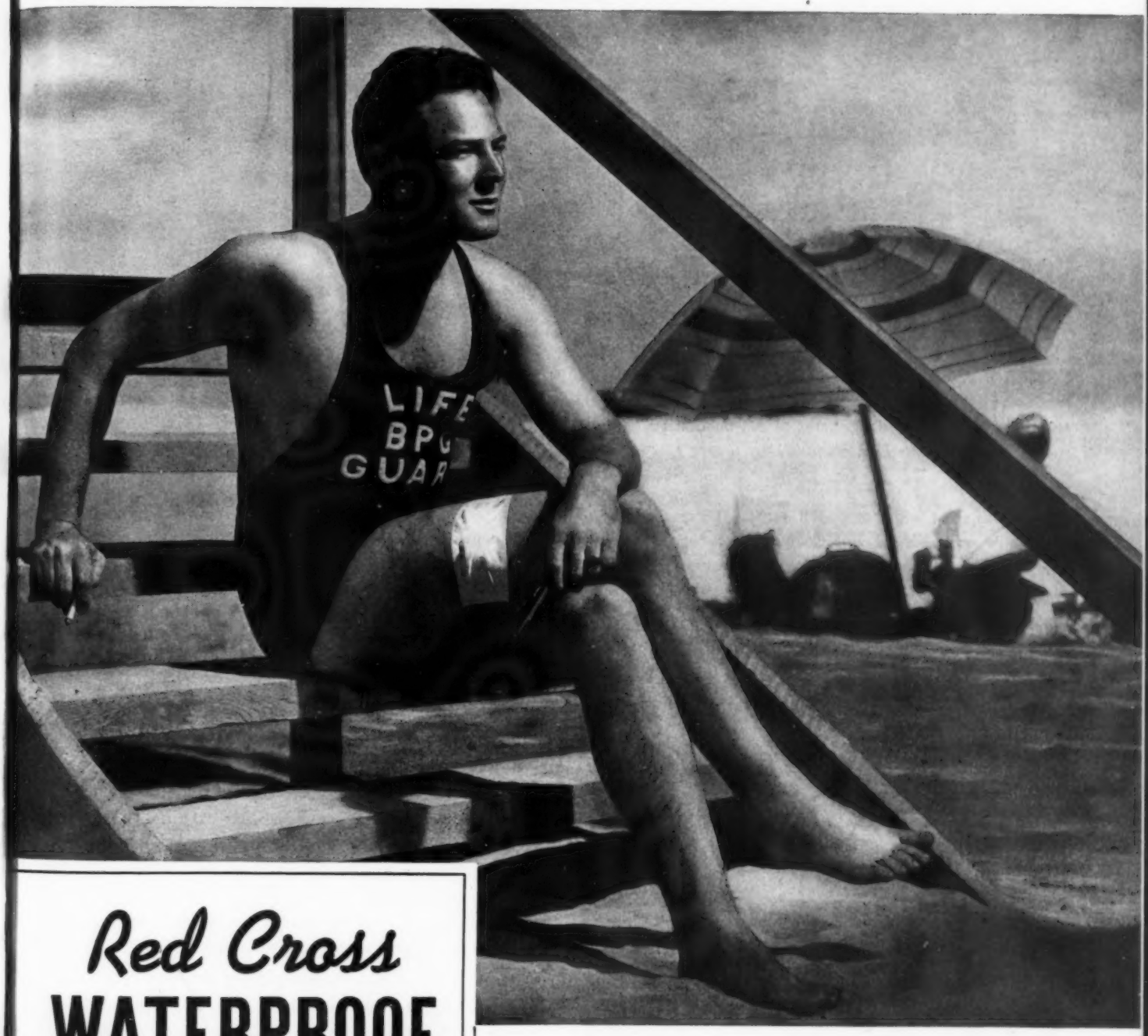

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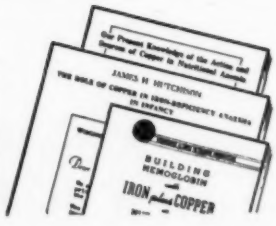

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Industrial Medicine | Volume 9 SEPTEMBER, 1940 Number 9 | Industrial Medicine

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IN INDUSTRIAL MEDICINE'S eight years (our first number was published in October, 1932) we have had some issues of which we have been rather proud. But, in most of the respects in which any issue can be called good, none was better than this one. Here are a scope of subject matter and a diversity and authenticity of treatment rarely encountered in any published form. EXPERIENCE speaks: on timely and important matters. And it says something!

DR. HAMLIN'S "Silicosis in Iron Ore Workers," (page 428), DR. WRIGHT'S "Industrial Medicine and its Relation to Peripheral Vascular Disease and Injury," (page 460), and MR. NELSON'S "Pre-employment Examinations," (page 451) were presented at the Twenty-Fifth Annual Meeting of the AMERICAN ASSOCIATION OF INDUSTRIAL PHYSICIANS AND SURGEONS at New York in June. They are typical of the quality of the whole program of that meeting — and thus indicative of the similar excellence of the other papers not yet published, and still to come in early numbers of this Journal. The two Committee Reports, "The Employability of the Handicapped," (page 441), and "Studies on Absenteeism," (page 450), were also given at that meeting. The "Proposed Plan for Recording Industrial Absenteeism," (page 486), was a part of the Absenteeism report. The other study which that report mentions, that of the Air Hygiene Foundation, was described in INDUSTRIAL MEDICINE for June, 1940,

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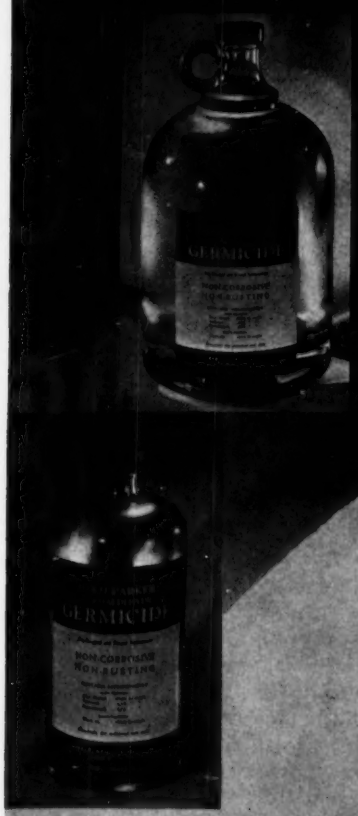

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American Association of Railway Surgeons

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Association of Surgeons of the New York Central System

SEVENTEENTH ANNUAL MEETING,
September 24, 25, and 26, 1940,
The Biltmore, New York City.
(Program on page 478.)

Michigan Society of Industrial Physicians and Surgeons

In conjunction with MICHIGAN STATE MEDICAL SOCIETY, September 24, 1940.

Georgia Association of Industrial Surgeons

THIRD ANNUAL MEETING,
September 25, 1940,
Ansley Hotel, Atlanta, Georgia.
(Program on page 478.)

American Association of Industrial Physicians and Surgeons

TWENTY-SIXTH ANNUAL MEETING,
Week of May 5, 1941,
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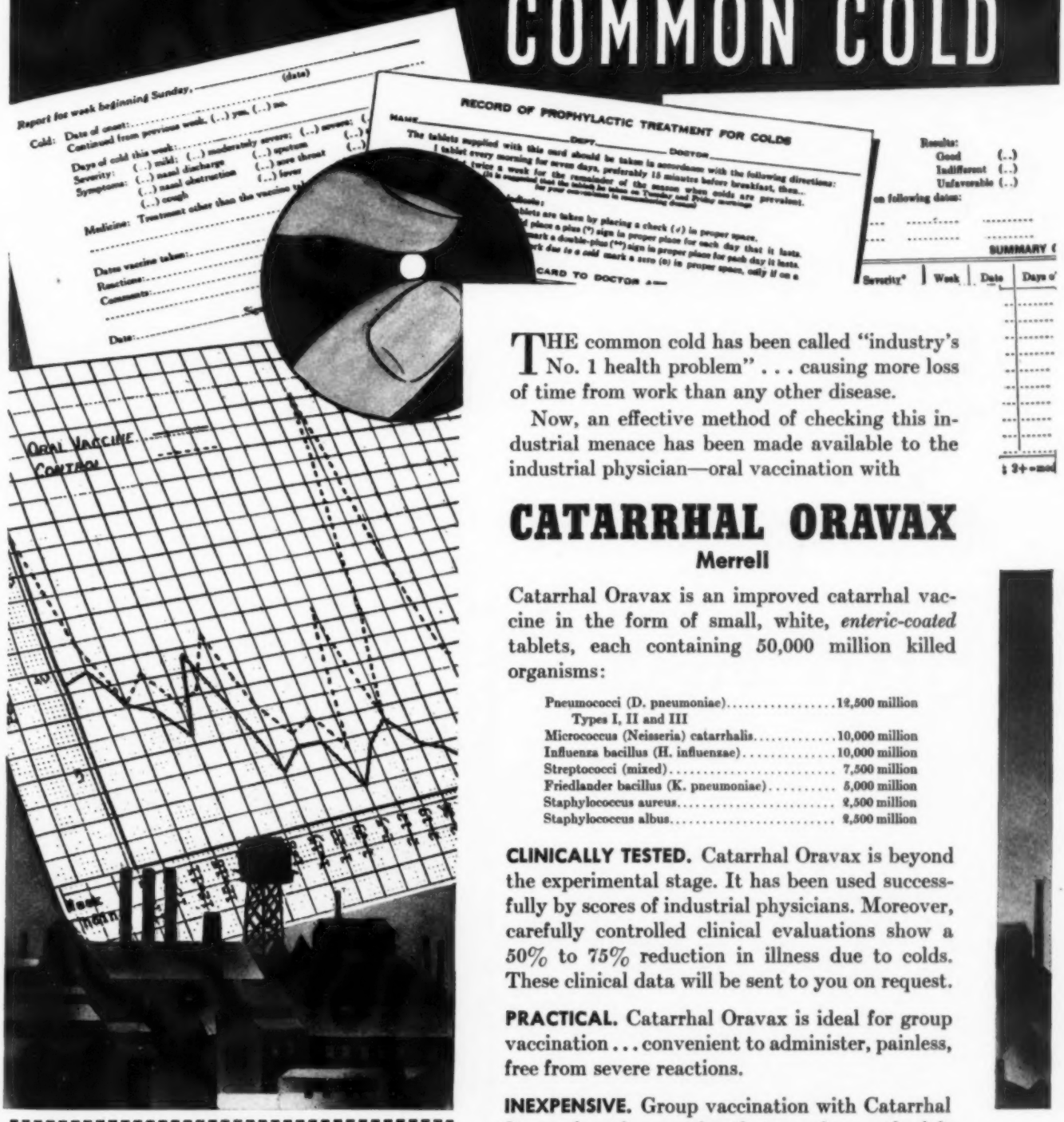

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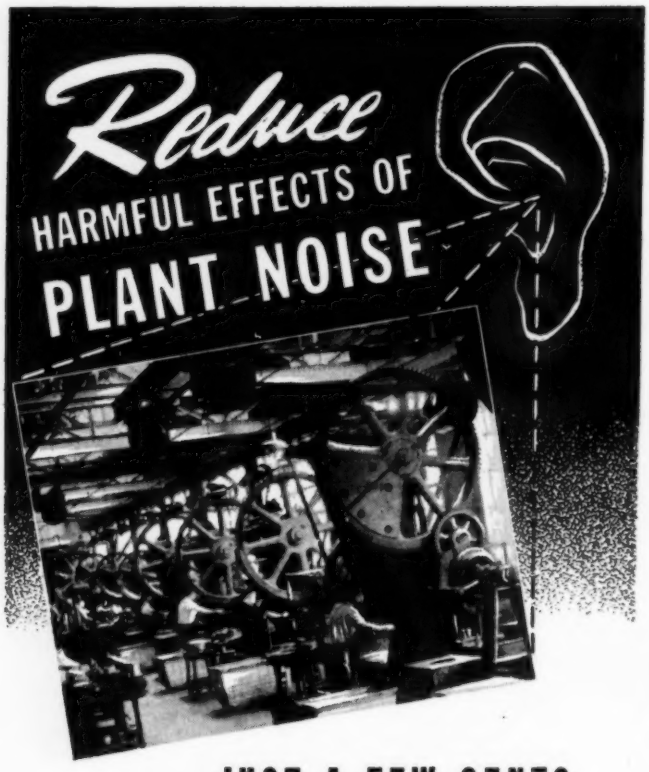

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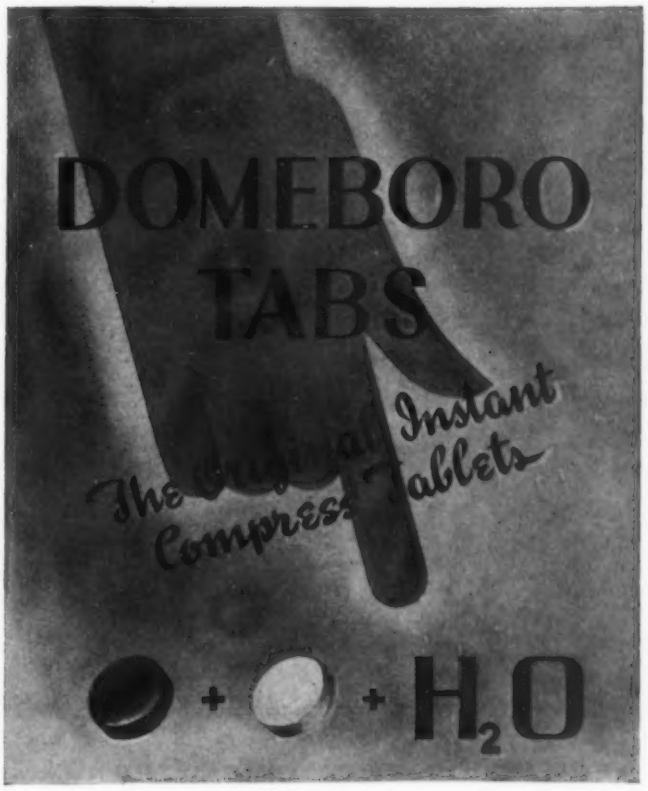

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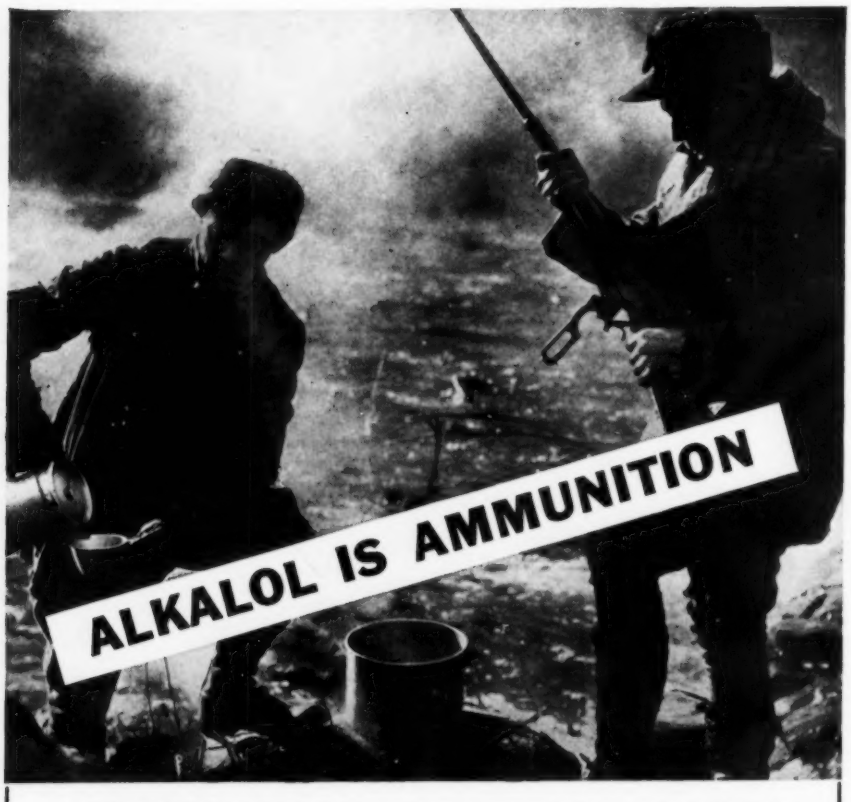

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—*Continued from page 3.*

(page 319), and a punch card and recording forms were described in May, (page 272). These reports are also indicative — of the growing realization of the importance of the A. A. I. P. & S., the place it occupies in the *economic* as well as the medical life of the nation, and the work it is doing and can do. They also show that Committee appointments, these days, are considerably more than honorable mention. They mean *work*. And the reports here published are high standards in that relation, as to both quantity and quality.

DR. KUHN'S "Appraisal of Vision in Industry," (page 456), has a real message; DR. MILLER'S "Practical Points," (page 458), covers very well the "important facts that should be kept in mind in the diagnosis and care" of injuries in the region of the shoulder; and NELL CONWAY'S "Lead Poisoning from Unusual Causes," (page 471), while it doesn't show lead poisoning as any less an occupational hazard, does disclose that its "unrecognized hazards in unexpected places and under unsual forms," make it much less exclusively occupational.

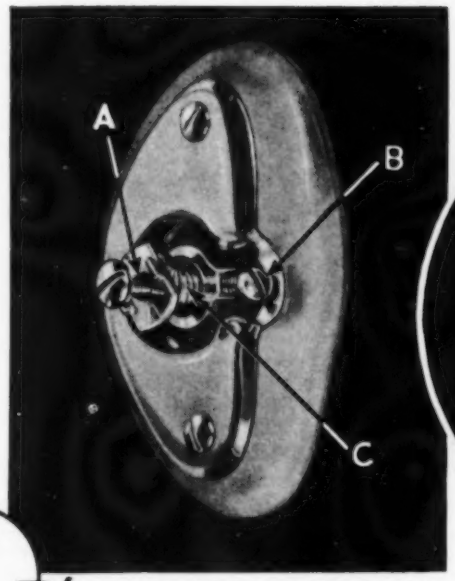
THEN come the Programs of three September meetings. We have run out of adjectives regarding the excellence of programs—unfortunately just at the time when the very best of all adjectives would not be amiss in describing these programs. But who can read the lists of titles without being as much impressed *per se*, and as anxious to attend whichever of these meetings he can get to, as he could possibly be by any "gilding" here? READ them here; and HEAR them there—at New York, Atlanta, or Chicago, as the case may be.

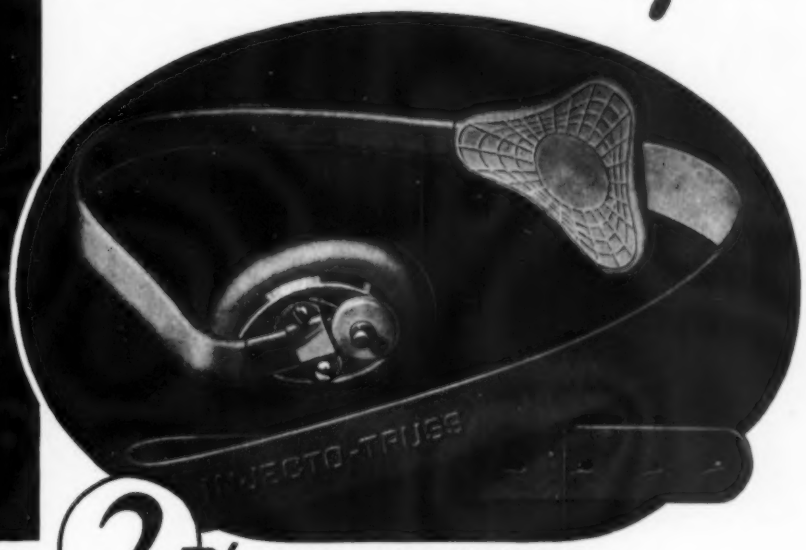
As to meetings, the next meeting, the Twenty-Sixth Annual, of the AMERICAN ASSOCIATION OF INDUSTRIAL PHYSICIANS AND SURGEONS will be held during the week of May 5, 1941 at Pittsburgh, Pennsylvania. In MAY, next year, instead of June!

DR. MURAT'S "Prophylaxis of the Common Cold," (page 482), covering a clinical study carried out for two years on 1273 individuals, is particularly timely; "the common cold causes more lost time than any other illness."

NEXT month we plan to present, among other superior articles, DR. SAPPINGTON'S account of the "Symposium on Industrial Health" to be given this month at the Medical College of Virginia, at Richmond.

2 SUCCESSFUL METHODS FOR TREATING *HERNIA!*





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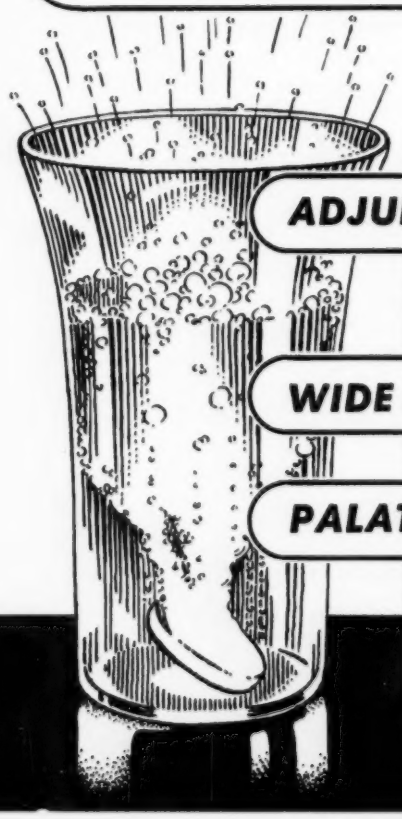

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Butler, P.: Indust. Med. 8; 324, 1940
..... J. Internat. Coll. Surgeons 3; 1940
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Silicosis in Iron Ore Workers

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IN THE past few years silicosis has received so much attention and publicity that a certain amount of confusion exists, in interpreting some aspects of the disease. The combination with other conditions such as tuberculosis, pneumonia and even other dusts makes it increasingly difficult to evaluate the x-ray and the clinical symptoms.

The frequent association of tuberculosis with silicosis is well recognized and while not minimizing its importance in the least, I feel that we have had to change our ideas somewhat about it during the last decade. A few years ago, rather dogmatic statements were made, which need revision in the light of later experience. For instance, it was stated that if a man had silicosis he would probably be dead in from five to 15 years.

We now know that this is not so and *we* are under the impression, at the present time, that silicosis, uncomplicated, and symptomless, is *not* a disabling disease.

We have adopted the following classification of silicosis, based on x-ray interpretations by Dr. Homer Sampson, Trudeau, New York:

N. Normal chest.

P_1—Stage of Peritruncal Exaggeration in which the linear markings are slightly exaggerated and might be comparable to the bark on a tree.

P_2—Stage of Marked Peritruncal Exaggeration which is a slightly more advanced stage than the preceding one and constitutes the "Pre-silicotic" condition.

S_1—First Degree Nodulation. Here there is some obliteration of the linear markings accompanied by formation of definite nodules whose average diameter is less than 2 mm. This stage is comparable to the tree in half leaf and represents an established silicosis.

S_2—Second Degree Nodulation. In this stage the nodules have increased in size from 2 to 4 mm. and the linear markings are more obscure.

S_3—Third Degree Nodulation. In this stage the nodules are greater than 4 mm., the linear markings are obliterated and the tree is in full leaf.

These stages constitute "Uncomplicated Silicosis." When infection, usually tuberculosis, enters the picture the disease is classified as "Complicated Silicosis." In this latter division we recognize "Silicosis with Fresh Infection" and "Silicosis with Old Infection." If there is some doubt as to the activity of the infection, whether old or fresh, it is called "Silicosis with Indeterminate Infection." The accompanying x-rays illustrate the various types.

(Illustrations of Classification of Silicosis follow on pp. 430, 431.)

In addition to the above are cases of silicosis complicated by non-tuberculous infections such as pneumonias.

Because there has been some lack of agreement in the clinical findings in silicosis, it should be pointed out that conditions may vary in different locations. What may be true in one particular section of the country is not necessarily the case in other places and in other industries. Hence what I have to say represents only my experience with iron ore workers during the last 10 years.

SILICOSIS is no new disease to the doctor engaged in the practice of medicine in the mining areas, and nothing unusual to the hardy specimens who have spent their lives facing the hazards incident to mining iron ore. It is still the same old "Miner's Complaint" of the tin mines of Cornwall, the gold fields of Africa and Canada, the coal beds of Pennsylvania and the iron deposits of Upper Michigan: with this difference, however, that knowledge gained by recent study,

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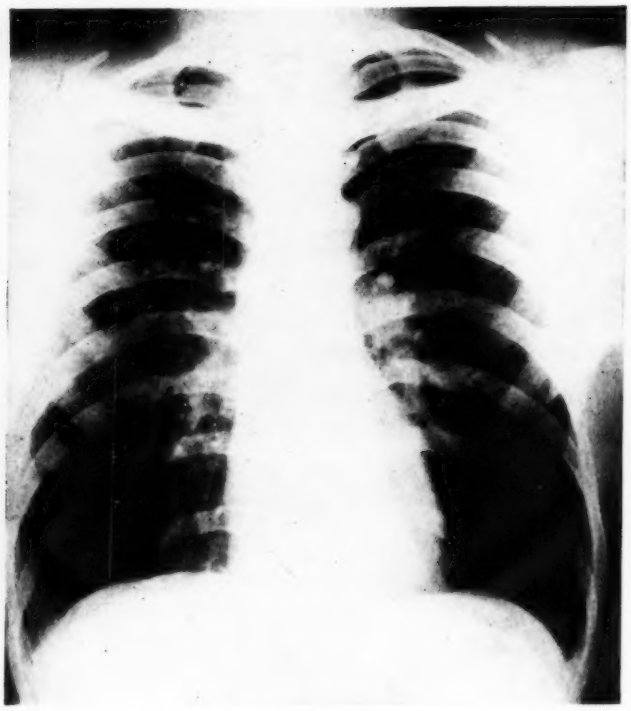


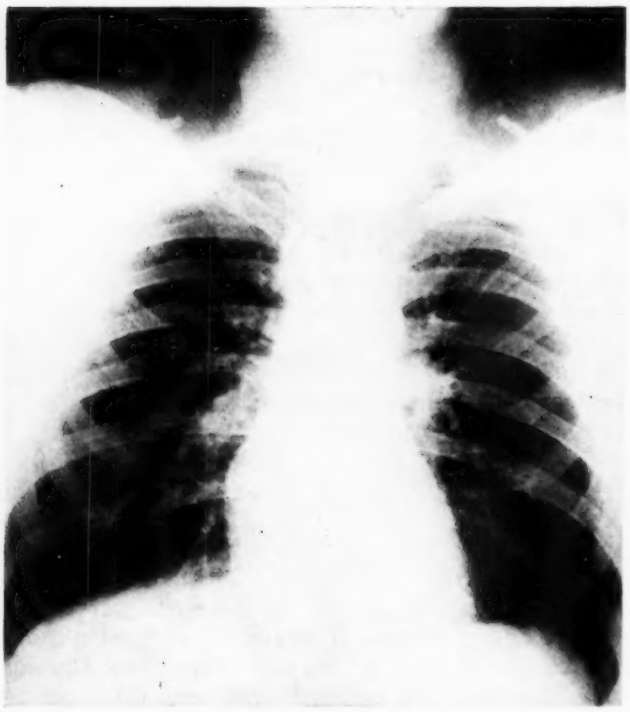
Normal Chest

P$_1$ Stage of Peritruncal Exaggeration

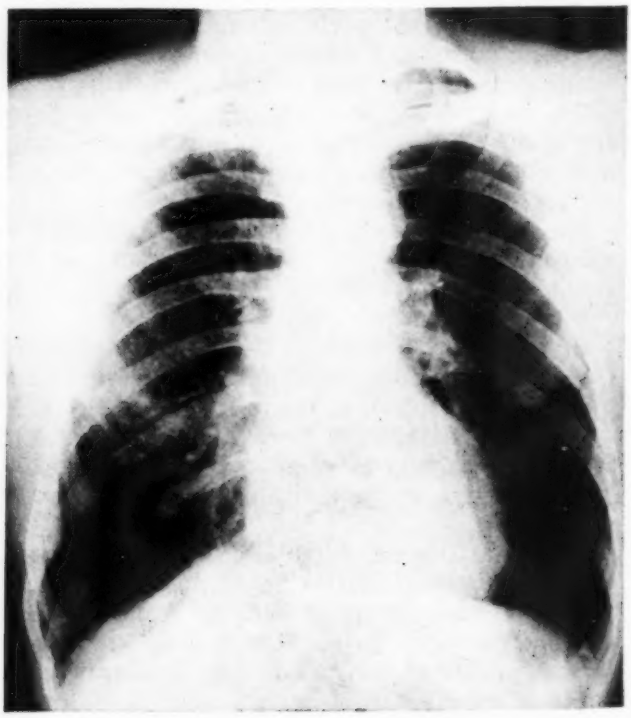
and the application of sound preventive measures, have robbed the disease of much of its terror.

We no longer expect new cases of silicosis in our mines, but a very considerable few remains amongst those who, like the characters in the popular newspaper cartoon, were "born 30 years too soon."

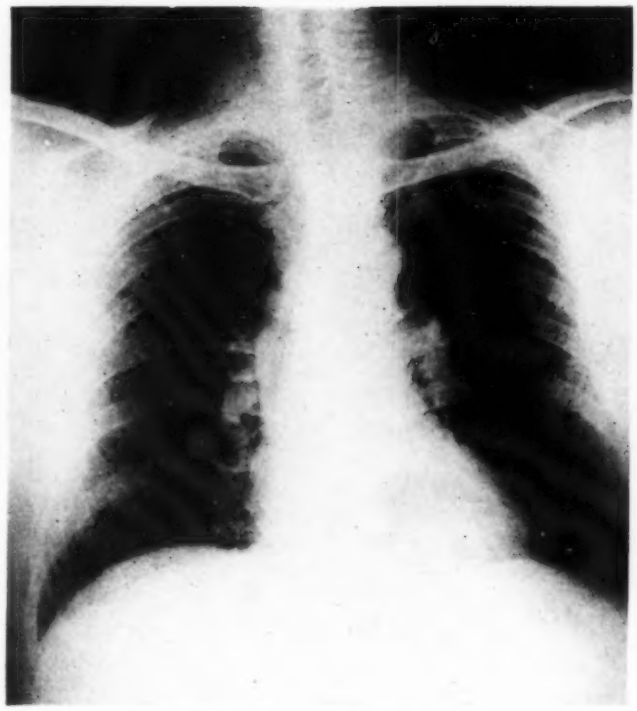
When tuberculosis makes its appearance in the family of a silicotic miner, the situation can be baffling. In many cases it is extremely difficult to convince the man that he has contracted a dangerous disease. When informed that his x-rays show evidence of infection he is ready to give up or else he shows disbelief. Because he feels well he cannot be persuaded to enter a sanatorium. In certain districts a peculiar hysteria about entering an institution for the treatment of tuberculosis exists. For years these people have tried to treat themselves at home. Many have gone on, in ignorance, with the disease unrecognized because they have not felt sufficiently ill to consult a doctor. When finally they have be-



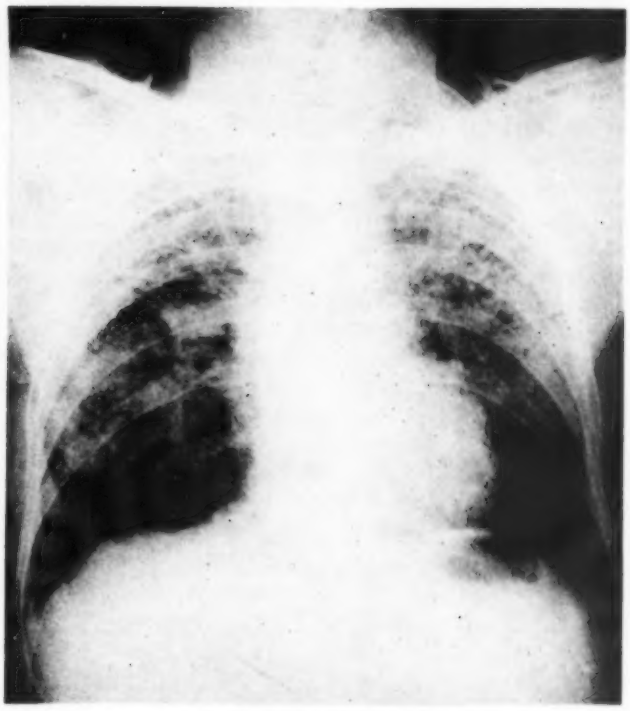
P$_2$ Stage of Marked Peritruncal Exaggeration or Pre-Silicotic Stage



S$_1$ Stage of First Degree Nodulation



S2 Second Degree Nodulation

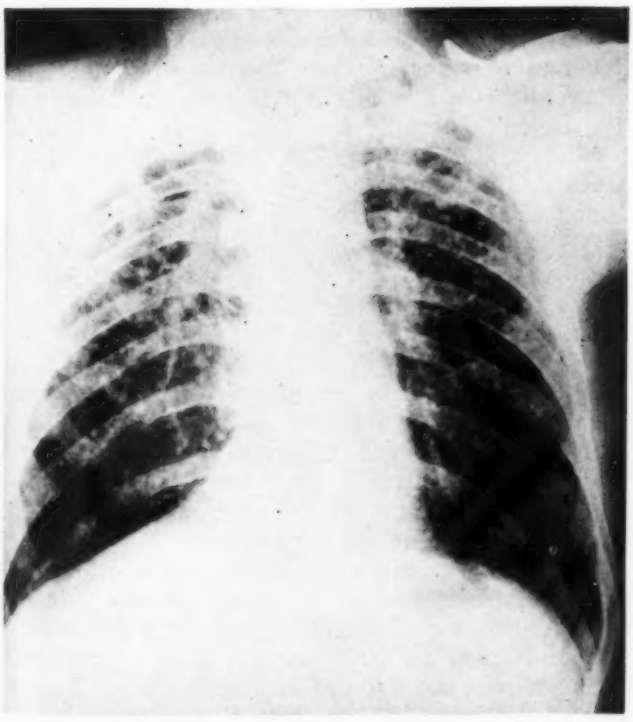


S3 Third Degree Nodulation

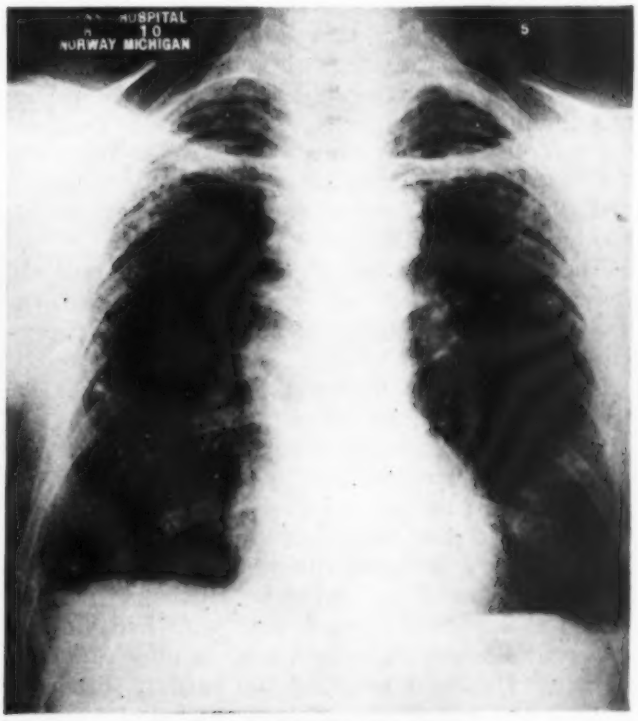
come a burden and cannot care for themselves any longer, they decide to enter a sanatorium when it is too late.

As a consequence, those at home, having seen a number of patients go to the sanatorium and die, have become convinced that no one can enter such an institution and come out alive. This antagonism is very hard to contend with. When we approach a miner who has silicosis and tuberculosis, and try to reason with him about entering a sanatorium, we already know what his response is likely to be. Pleading, cajoling and threats of pressure have little effect. When it is pointed out that someone else has gone there and come home cured, his reply is: "Oh, he didn't have it in the first place!" This, of course is not true of every mining location but it is a very real problem in some.

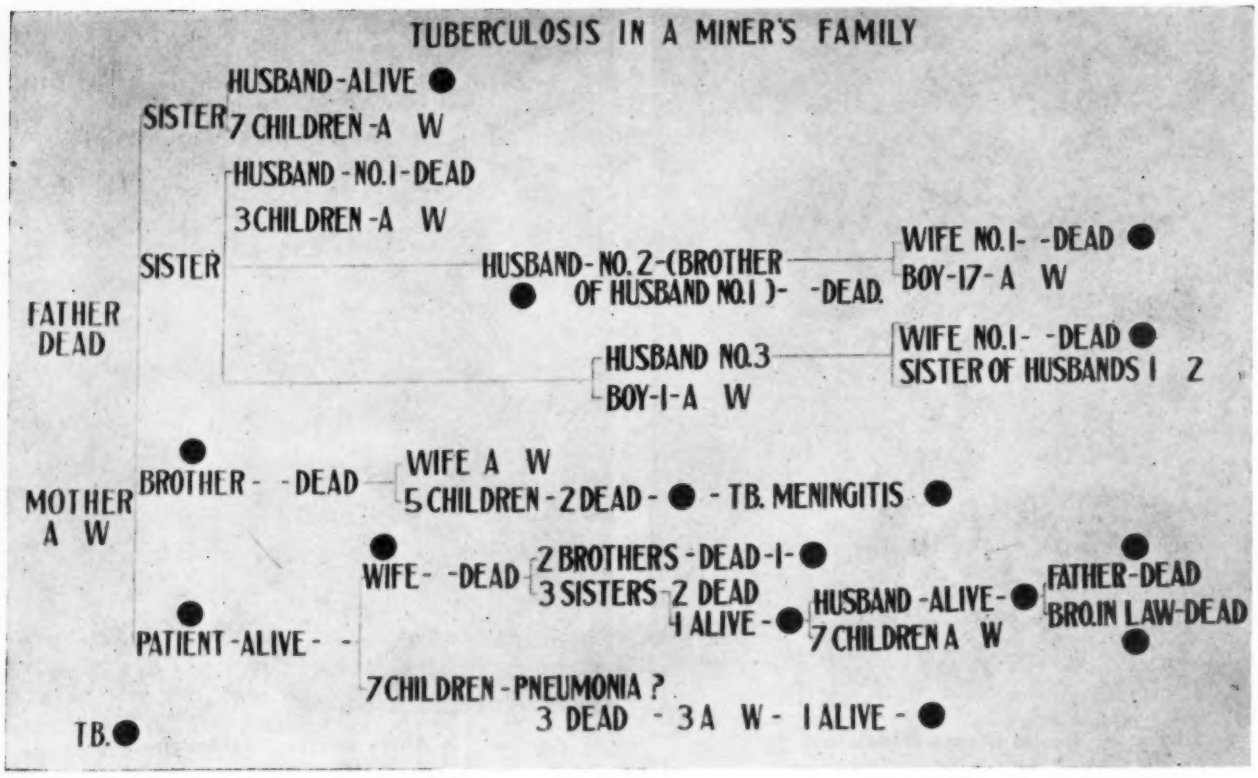
It is not difficult to visualize the results of this situation. Children become infected and manage to reach the age of adolescence and possibly marry. Then they break down but not be-



Silicosis with Fresh Infection — Note cavities in both apical regions



Silicosis with Old Infection



fore they have brought their progeny into the world to perpetuate the disease. The foregoing chart of one of these families is a graphic example of what can happen under such circumstances.

In this chart, the patient (lower left corner) has a far advanced silico-tuberculosis. His wife died of tuberculosis and in her family were two brothers and three sisters. One of these brothers died of tuberculosis and one died accidentally. Two of the three sisters died from causes other than tuberculosis so that of the whole family of five, only one sister is living and she has a well advanced pulmonary tuberculosis. Her husband is living but has a silico-tuberculosis. His father died of silico-tuberculosis and the brother-in-law of pulmonary tuberculosis. In the patient's immediate family were seven children, three of whom are dead from questionable pneumonia. Three are alive and well while the eldest, a girl of 14, has an adult type lesion.

The patient's brother died of silico-tuberculosis leaving a wife and family of five. The wife is well but two of the children have died of tuberculosis meningitis.

There were two sisters in the patient's family. One of these is the mother of seven children, all of whom are alive and well, but her husband has silicosis with evidence of infection. The other sister is well as far as can be determined. Her first husband died following a tonsillectomy. She then married husband number two, who was a brother of her first husband. Husband number two was a widower whose first wife had died of tuberculosis leaving a boy who is now 17 years of age. Husband number two died of tuberculosis, after which she married husband number three. Husband number three's first wife also died of tuberculosis and she was a sister of husbands one and two.

In this family, tuberculin tests were attempted but because of antagonism and lack of cooperation the results are incomplete. However as many tests as possible were done, with the following results:

In the first sister's family, seven out of seven tests (purified protein derivative, first strength) were negative. Three of this group were x-rayed, the father showing active tuberculosis and silicosis, and one child a primary complex.

The second sister's family showed four negative and one positive reaction on first strength tuberculin. On second strength tests all the negative reactors became positive. Thus this whole family, which includes the father and mother, gave positive reactions. Only one x-ray was obtained in this group and that was negative.

The brother's family showed three positive tuberculin reactions out of three tests. In other words the three living children all had positive reactions and all had negative chest x-rays.

The patient's family showed two children out of the four, positive on first strength and two negative. The two negative cases became positive with second strength tuberculin. Chest x-rays showed one positive adult type tuberculosis in the eldest girl, aged 14, two primary complexes and one negative in the others.

The brother-in-law's family showed eight out of eight negative on first strength but five out of seven children positive on second strength tuberculin. X-rays on both parents showed positive active lesions but five out of five children's x-rays were negative. The mother of this family has steadily resisted all efforts to get her into a sana-

torium. She has become much worse but insists that she is not ill because she feels well. One year ago she was delivered of a healthy, normal child, but refused to part with it when an opportunity was presented of placing the child in her sister-in-law's care, where there were no other children and the surroundings were exceptionally good. Her tuberculosis advanced and she developed a fair-sized cavity. In the meantime she became pregnant again and a few weeks ago, much against her will, came to the hospital for her delivery. Another well developed, normal nine pound boy was born, making a total of nine boys in about as many years. An x-ray taken at this time showed an increase in her infection but the cavity had disappeared.

IT HAS been our misfortune to deal with silicosis in a community where tuberculosis has been unusually prevalent. For the past 10 years we have battled this situation with all the means at our disposal. We have developed an organization with the help of the Saranac Laboratory, and the whole-hearted and enthusiastic support of the mining companies. The problem has been attacked by means of field nurses, wholesale tuberculin testing of employees and their families, yearly examinations of the men and those of the families who can be reached, follow up x-rays and educational methods. Results are not spectacular and ignorance and superstition have proved obsatcles which are hard to overcome, but progress has been made.

TABLE 2
Tuberculin Tests

	Number Tested	Positive Reactions	Percentage
Employees	412	220	53.4
Families	820	250	30.4

A tuberculin survey, carried out with considerable difficulty amongst employees and members of their families, gave the results indicated in the above table. Purified protein derivative tuberculin, first strength (0.00002 mg. in 0.1 cc.) was used on the employees. Eleven of these men received second strength tuberculin (0.005 mg. in 0.1 cc.) and of these 11 cases, eight were positive. In the families, all but 81 cases received second strength tuberculin. It is interesting to note that 53% of the employees gave positive reactions on first strength while only 30% approximately, of the members of the families gave positive reactions even when second strength tuberculin was used. However, it must be remembered that in the families the majority of individuals were children while in the employees group all were adults. This might account for the lower rate in the families, to some extent at least.

It has been noticed that one or more of silicotic employees breaks down each year. These have been discovered by repeated x-rays and frequent sputum examinations. Specimens are collected every two weeks from cases who it is thought may develop tuberculosis, or from those already classified by x-rays as having infection which is likely to become active. This method has been very effective and quite a few cases have been caught as soon as bacilli appear. The importance of adequate laboratory facilities cannot be overestimated in this work. Serial x-rays with regular concentrated sputum examinations and guinea pig inoculations are, in my opinion, a most reliable and satisfactory means of diagnosing silicosis and silico-tuberculosis.

The symptoms and signs of silicosis and silico-tuberculosis have been fully described elsewhere by Irvine, Simpson, Strachan, Riddell and others, so that it is not essential to go into this aspect of the disease in detail. An analysis of various signs and symptoms is presented to indicate how inconsistent these may be when checked with the actual condition of the men as revealed by x-ray and physical examination. They are reported, not to indicate the clinical picture of silicosis, but to emphasize the unreliability of such evidence. The subjects may actually have symptoms but their cause may be due to conditions other than silicosis.

Out of a group of approximately 400 miners who have been examined thoroughly and repeatedly, 84 cases were selected and divided into three representative classes for the purpose of comparison. To avoid undue influence of psychological

TABLE 3
Silicosis—Clinical Signs—Symptoms
Frequency Percentage

Symptom or Sign	Pre.	Uncomp.	Comp.
Number of Cases	22	37	25
Good appetite	95.3	91.8	88.0
Dysp. on exertion	72.6	78.3	92.0
Healthy appearance	90.1	67.5	60.0
Limited expansion	36.3	59.4	68.0
Inc. pulse rate	36.3	35.1	64.0
Sputum in A.M.	22.7	27.0	64.0
Hyperresonance bases	4.5	16.2	60.0
Inc. sediment rate	45.4	35.1	56.5
Lowered vital capacity	18.2	37.8	48.0
Cough	9.1	32.4	48.0
Fixation of chest	13.6	21.6	48.0
Pos. T.B. reaction	31.8	32.4	47.8
Inc. resp. rate	22.7	21.6	32.0
Rales	18.2	10.8	32.0
Impaired resonance	13.6	18.9	32.0
Cyanosis fingers	9.1	29.7	32.0
Emphys. type chest	50.0	40.5	28.0
Contact with T.B.	9.1	13.5	24.0
Bronchial breathing	0	2.7	20.0
Inc. vocal fremitus	4.5	5.4	20.0
Overdevel. of access. mus.	0	13.5	20.0
Sense of restriction	4.5	8.1	20.0
Prolonged expiration	0	5.4	16.0
Clubbing of fingers	4.5	5.4	16.0
Headache	4.5	5.4	16.0
Elevation of temp.	4.5	5.4	12.5
Dullness	0	10.8	8.0
Emaciation	0	5.4	8.0
Inf. or costo abd. resp.	40.9	32.4	16.0
Dizziness—night sweats	4.5	2.7	8.0
Dysp. at rest	4.5	2.7	8.0
Flatness	0	0	4.0
Asymmetry	4.5	5.4	4.0
Insomnia	9.1	5.4	4.0
Nausea in A.M.	0	0	4.0
Chest pains	4.5	2.7	4.0
Orthopnea	18.2	5.4	4.0
Palpitation	0	5.4	0
Lowered R.B.C.	4.5	2.7	0
Fever	0	0	0

factors, no litigants were included. (See Table 3.)

In the first group are 22 cases classified as "Marked Peritruncal Exaggeration." These comprise the "Pre-silicotic Group" and, as the name indicates, represents those individuals who are on the verge of becoming silicotics.

The second group is composed of 37 cases of uncomplicated silicosis. No distinction has been made as to the stage of the disease, whether first, second or third degree nodulation, and no case in which infection has entered the picture or been read into the x-ray, is included.

The third group consists of 25 cases interpreted as having infection in addition to some degree of silicosis. The classifications are based on Dr. Sampson's x-ray interpretations in all cases.

An intensive clinical study of these three representative groups was made to determine whether any signs or symptoms were constantly associated with different degrees of pulmonary fibrosis. Evaluation of symptoms was difficult, in many cases because of factors already mentioned.

No distinction is made between signs and symptoms in this grouping. They are arranged in order of frequency of occurrence, to obtain some idea which are most common. An analysis of these findings reveals that most of the complaints run as one would expect, with the lowest percentages in the pre-silicotic group, higher percentages in the silicotic group and highest percentages in the class with infection. However certain inconsistencies appear which might warrant further investigation.

In many instances there is little difference between those men with a pre-silicotic condition and those with a definitely established, uncomplicated silicosis. In others, the results are opposite to what might be anticipated. For instance, 22.7% of the pre-silicotic group showed an increase in the respiratory rate, while 21.6% of the uncomplicated cases did the same. Rales were present in 18.2% of the pre-silicotics as against 10.8% of the uncomplicated class. Dizziness, night sweats and dyspnea at rest, were more common in those with pre-silicosis than in those with definite pulmonary fibrosis. The complaint of nausea or vomiting in the morning, was noted in 4.0% and that only in far advanced silico-tuberculosis. Practically none of these men complained of digestive disturbance of any sort. A few had rather indifferent appetites but the majority had exceptionally good ones. In those who did complain of indigestion, it was usually found that the cause was due to some other condition such as chronic cholecystitis or hyperacidity. As many men in the pre-silicotic group complained of chest pain as in the complicated division. Very few of the uncomplicated silicotics admitted this symptom. Not many complained of orthopnea but the percentage was considerably higher in the pre-silicotic than in the other two groups.

The most common complaint was dyspnea on exertion. Seventy-two percent of the pre-silicotics, 78% of the uncomplicated and 92% of the complicated cases stated that they suffered from shortness of breath on exertion but while at rest or "walking on the level" they did not notice it.

TABLE 4
EXERCISE TEST
Climbing 20 Steps

	12 CASES Pre-Silicosis	29 CASES Uncomp. Silicosis	22 CASES Complicated Silicosis
No Dyspnea	8.3	20.6	0
Slight Dyspnea	66.6	37.9	54.5
Moderate Dyspnea	25.0	41.3	40.9
Marked Dyspnea	0.0	0.0	4.0

On checking this complaint with an exercise test, however, the responses were inconsistent and could not be correlated either with their complaints or with the degree of reaction observed in their chests. (Table 4.)

The test consisted of climbing a flight of 20 steps. After careful instructions as to how fast to proceed, an endeavor was made to control the men in order to keep the test as uniform as possible. By actual trial, and timing with a stop watch, 10 seconds was decided upon as normal time to reach the top step. The test gave only an approximate value. Some of the worst silicotics ran up the stairs in a few seconds, to show how good they were, and very few exceeded the 10-second limit. One man (8.3%) in the pre-silicotic group, 17.2% of the uncomplicated silicotics and 31.8% of the complicated silicotics required more than 10 seconds to complete the test. This is as one might expect, but on the other hand all but one, or 91%, of the pre-silicotic group complained of shortness of breath as compared to 79% in the uncomplicated group and 100% in the complicated group. Observation of the men seemed to show that many more in the pre-silicotic group were slightly out of breath than those with definite disease. But where infection entered the picture, *all* complained of dyspnea. Marked dyspnea was noted in only one case, and this man, one of the worst cases of massive fibrosis, did the trip in seven seconds. These results merely point out the incon-

TABLE 5
PULSE AND RESPIRATION RESPONSE TO EXERCISE

	10 CASES Pre-Silicosis	25 CASES Uncomp. Silicosis	22 CASES Complicated Silicosis
Pulse increase immediately after exercise	Av. 25	Av. 20	Av. 16
Pulse increase three minutes after exercise	Av. 3	Av. 0.8	Av. 1
Number with exact return to normal after three minutes	0 %	4 %	22.7 %
Respiratory increase immediately after exercise	Av. 5	Av. 4	Av. 4
Respiratory increase three minutes after exercise	Av. 1	Av. 1.2	Av. 1.6
Number with exact return to normal after three minutes	70 %	56 %	50 %

sistent behaviour that *any* group of individuals might display upon being subjected to a sudden and unfamiliar form of exercise. Nevertheless it is obvious that in a majority of these men, their actual dyspnea is much less evident than their complaint, and one should look for other causes of shortness of breath as well as the amount of silicosis present.

The pulse and respiration response to exercise was also noted during the test. The average increase in the pulse rate in 10 pre-silicotics was 25 per minute; in 25 uncomplicated silicotics 20 per minute and in 22 complicated silicotics, 16 per minute. Three minutes after exercise the average increase in the respective groups was three, 0.8, and one beat per minute. None of the pre-silicotics returned to an exact normal after three minutes while 4% of the uncomplicated and 22.7% of the complicated did. (Table 5.)

There was very little difference in the increase in the respiratory rate in the three groups except that 70% of the pre-silicotics returned to normal in three minutes while 56% of the uncomplicated and 50% of the complicated did likewise. The fact that the average increase in respiration rate was practically the same in the three groups would seem to bear out the statement that actual dyspnea is not so evident in silicotics as we see them. In the complicated group were several really massive fibroses and yet in the whole test only one man, already mentioned, showed actual marked shortness of breath. The decidedly inconsistent behaviour of these men, in response to exercise, makes one very skeptical of the value of this form of exercise test. Possibly some other would have yielded better results.

Weight changes have been observed in these men and recorded over a period of six years in 91 cases. (See Table 6.)

Over half the men in each group remained stationary while only 9 to 13% showed a loss. A gain was noted in from 25 to 35%. Loss of weight, therefore, does not seem to be very noticeable. In this series, 13% of the pre-silicotics showed a loss of weight as compared to 10% of the complicated silicotics. Thirty-six percent of the complicated cases showed a gain as against 34% of the pre-silicotics. Such discrepancies demand investigation, or at least explanation.

TABLE 6
WEIGHT CHANGES OVER SIX-YEAR PERIOD

Group	Gain	Loss	Stationary
Pre-Silicotic..... 23 Cases.....	34.7% Av. 15 lbs.	13.0% Av. 15 lbs.	52.3%
Uncomplicated Silicotic.... 38 Cases	25.0% Av. 18 lbs.	9.4% Av. 31 lbs.	65.6%
Complicated Silicotic..... 30 Cases	36.7% Av. 18 lbs.	10.0% Av. 12.5 lbs.	53.3%

However, when it is pointed out that all the complicated cases had been moved to surface at light work, while many of the uncomplicated and pre-silicotics were carrying on at their usual jobs underground, the picture becomes more intelligible. A gain in weight and improvement in the general physical condition is quite noticeable in these individuals shortly after they have been moved to surface. Many of their symptoms disappear. Some state that they expectorate less after coming to surface although others say that they do not notice any difference.

In a group of 42 cases of complicated silicosis, 13, or 30.9%, showed tubercle bacilli in the sputum. These were checked during the years 1936, '37, '38, '39. (Table 7.) Twelve of these cases were studied in an attempt to correlate the time of appearance of infection in the x-ray with the appearance of tubercle bacilli in the sputum. Because regular bi-monthly sputum examinations were not run until 1938 it is conceivable that some of these might have been observed earlier. Con-

TABLE 7
APPEARANCE OF INFECTION IN THE X-RAY COMPARED TO APPEARANCE OF TUBERCLE BACILLI IN THE SPUTUM

Case No.	No. of Spec.		1936		1937		1938		1939		
	Neg.	Pos.	Sputum	X-ray	Sputum	X-ray	Sputum	X-ray	Sputum	X-ray	
204	9	15	0	0	0	X	X	X	X	X	1 Year
51	5	10	0	0	0	0	0	X	X	X	
184	20	1	0	0	0	0	0	X	X	X	
198	24	4	0	0	0	X	X	X	0	X	
72	8	7	0	X	0	X	X	X	X	X	2 Years
105	3	2	0	X	0	X	X	X	Sanatorium		
4	24	5	0	X	0	X	X	X	0	X	
59	8	3	0	0	0	X	0	X	X	X	
110	1	1	0	0	0	0	X	X	0	X	Coincident
73	15	1	0	0	0	0	X	X	0	X	
75	4	3	X	X	Sanatorium						
15	3	2	0	0	X	X	Sanatorium				

siderable difficulty was experienced in getting the men to cooperate in sending in specimens, so that we finally had to resort to collecting them ourselves. However the results are fairly representative of what we see clinically.

It will be noted that in four cases the appearance of bacilli in the sputum was coincident with the appearance of infection in the roentgenogram. In four cases the infection was read in the x-ray approximately a year before a positive sputum was found. In the remaining four cases, infection was noted two years previous to positive suptum. In no case was a positive sputum found before the infection was diagnosed in the x-ray.

These sputa do not necessarily remain positive. Case No. 4 had five consecutive positives and then became negative and has remained so for two years. Cases 110, 198 and 73 have also become negative and remained so.

We have not had a sufficiently large number of cases nor observed them over a long enough period of time to give any estimate of the rate of progression of silicosis. One can only say that it tends to be very slow. We have had only nine cases, complicated and uncomplicated, out of approximately 100 who have shown actual progression of their nodulation. We have had 43 cases who, over this period, have shown a lessened degree of dust reaction in later x-rays. This may be due to the fact that the quality of the x-ray films is much better in later years than it was when the original films were taken. Newer and better equipment has been responsible for this factor.

A study of the progression of silicosis in the presence of infection was made in 38 cases observed over a period of six years. The study was based on x-ray interpretations, all of which were made by the same person. (Table 8.)

TABLE 8

SILICOSIS IN PRESENCE OF INFECTION—X-RAY INTERPRETATION
38 Complicated Cases Observed over a Period of Six Years

29 out of 29 Cases with Fresh Infection showed no Progression	100%
7 out of 8 Cases with Old Infection showed no Progression	87.5%
1 out of 1 Cases with Indeter. Infection showed no Progression	100%

ENTIRE DISTRICT
375 Cases Observed over a Period of Six Years

104 out of 107 Cases with Fresh Infection showed no Progression	97%
151 out of 154 Cases with Old Infection showed no Progression	98%
114 out of 114 Cases with Indeter. Infection showed no Progression	100%

Out of a group of 38 complicated cases of silicosis 29 out of 29 (100%) with fresh infection showed no progression of their nodulation over a period of six years. Seven out of eight cases with old infection (87.5%) and one case with indeterminate infection also showed no progression during this time.

A group of complicated silicotics (375 cases) from all the entire district showed 104 out of 107 with fresh infection who did not give any evidence of progression over the same period, i.e., 97%.

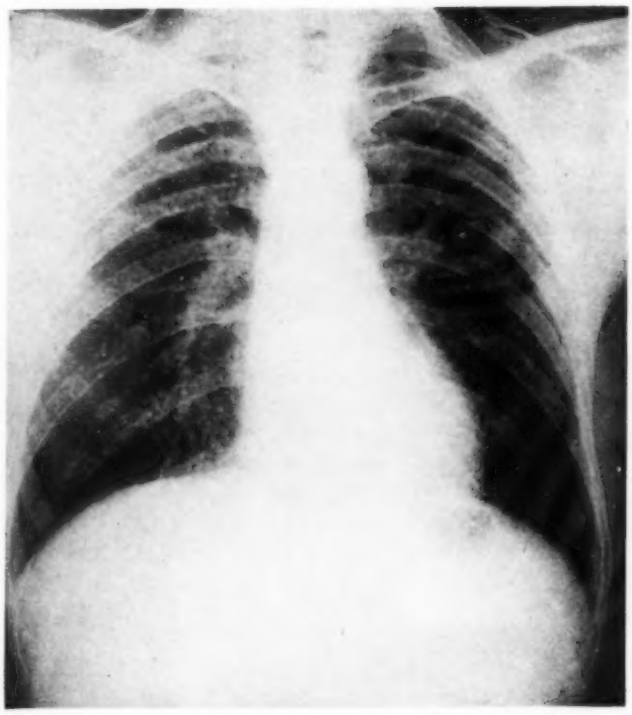
One hundred and fourteen out of 114 with indeterminate infection showed no progression of nodulation, while 151 out of 154 (98%) with old infection also showed no progression. That is, only three cases in the group with fresh infection, showed progression of nodulation over a period of six years and only four in the group of old infections. None of the indeterminate infections showed progression of silicosis.

This observation seems to indicate that infection may not be such an important factor in the progression of the disease. The tuberculosis may progress more rapidly in the presence of silicosis, and undoubtedly does in certain cases, but the striking feature is that the silicotic fibrosis tends to make associated infection most chronic. We have observed a considerable number of cases over six years, with very little change either in the x-ray or in the clinical condition. There is perhaps, more conglomeration of the fibrosis or the infection, more shadows indicative of infection, but progression is very slow.

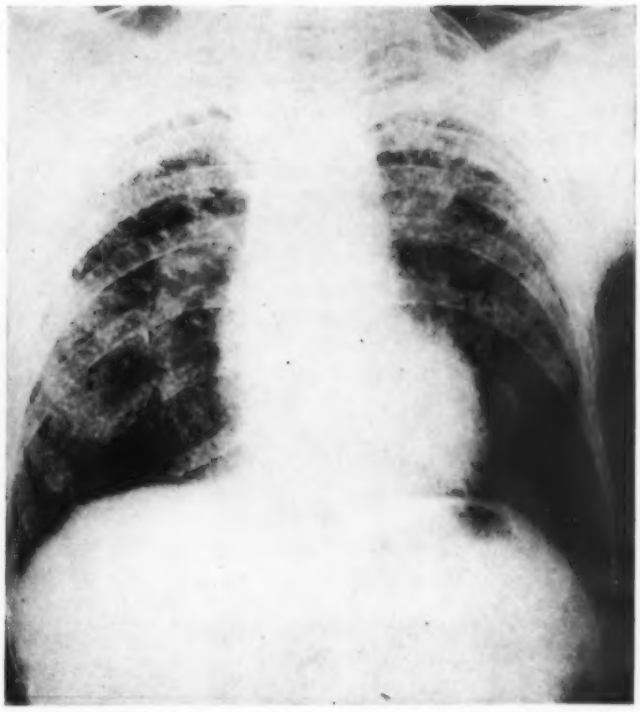
These men raise very little sputum, except possibly a small amount in the morning. Some of the worst cases state that they have difficulty in getting enough for their regular specimens. Hemoptysis is rare, even in advanced cases. An occasional case in a younger individual, does break down, however.

IT IS difficult to make any dogmatic statements about the progression of silicosis because many other factors have to be considered. If these men could have been observed for longer periods and x-rays of them observed for years back, from the time they started to work, the story would probably be different. Some of those now classified as first degree nodulation would, no doubt, have been normal and some or all of the second and third degrees would have been seen in earlier stages. These individuals have required time to develop their silicosis, which obviously implies progression. Some would have progressed whether removed from exposure or not or whether they had infection or not. Once removed from exposure, however, progression as observed thus far has been extremely slow. It would seem that the most important feature in the progression of silicosis is not so much the presence of infection but rather the continuance of exposure to silica. We have seen not a few men, once removed from exposure, whose readings have not changed even in the presence of infection. Also, in this study, there were more who progressed in the presence of old infection than in fresh.

It is quite conceivable that some of these men who have not shown progression in the presence of infection so far, will eventually do so. It is not implied that infection does not play *any* part in the progression of silicosis, but the study seems to indicate that this factor in some cases may have been exaggerated. On the other hand, out of 65



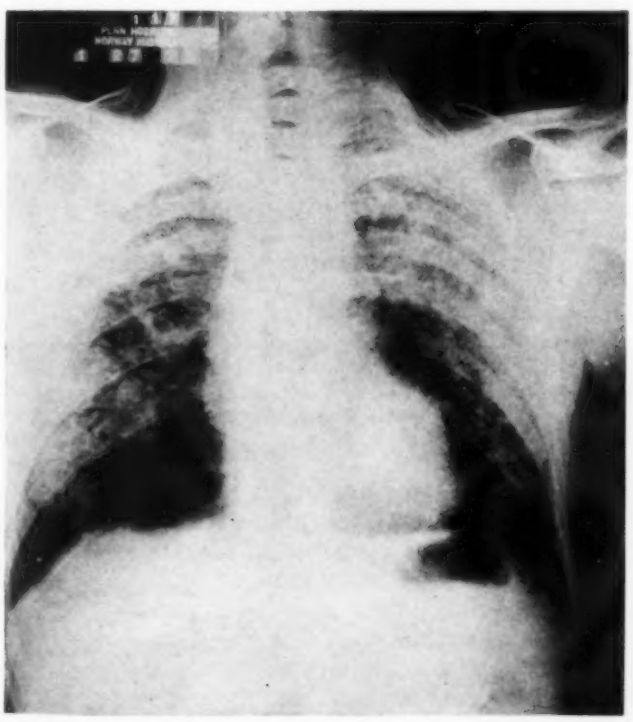
Progression of Silicosis. Film taken March, 1935, shows extensive and well developed first degree nodulation



Progression of Silicosis. Film taken four years later shows very definite progression of nodulation. Associated infection is possible but to date has not been read into the x-ray

cases *with* infection, all but nine had some degree of nodulation, or in other words, in the presence of infection all but 13% of cases having an average dust exposure of 30 years, developed silicosis.

In spite of the fact that the disease is, in most cases, very chronic one does note, in a few instances, a definite progression over a period of four or five years. The latest film compared with the previous one a year ago may reveal little or no change, but when compared with one taken five years ago there may be very definite evidence of progression. The illustrations on this page demonstrate the character of such changes in one individual's roentgenograms.



Progression of Silicosis. Film taken after six years shows progression to a third degree nodulation. Infection more suggestive but simple conglomeration and massive fibrosis could explain the dense shadows

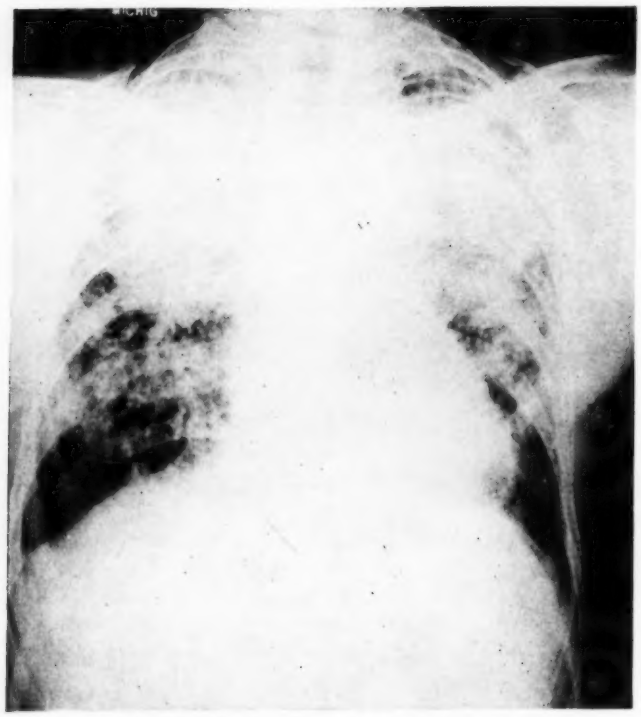
Frequently these men take "colds" which clear up readily under routine treatment, with no apparent bad effects. Even pneumonias seem limited, and I believe it is worth mentioning that I have seen very few cases of this disease amongst silicotics with whom I have come in contact.

Occasionally the terminal stage in a case of massive pulmonary fibrosis is ushered in with a sudden edema which proves fatal within a few hours. Such a case is illustrated in the accompanying x-ray (See page 438).

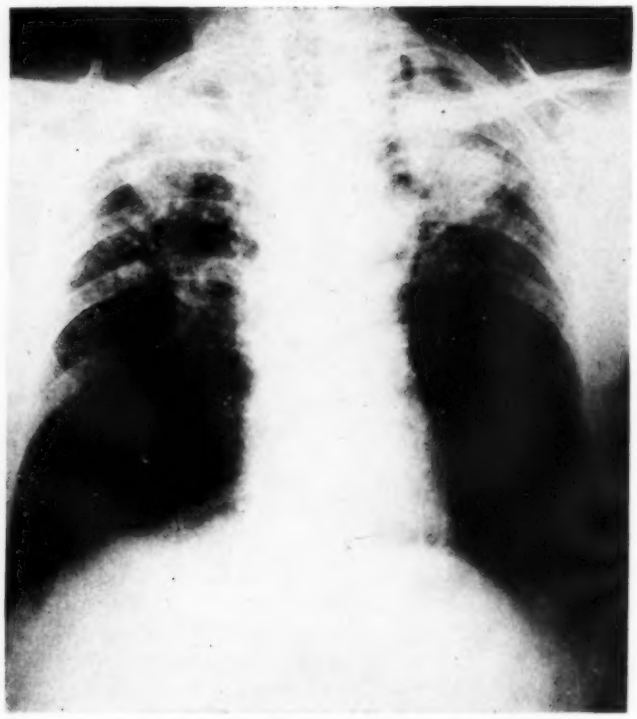
In the massive fibroses one observes an elevation of the diaphragm with a tendency to retraction of the lungs towards the apices, producing emphysema at the base and decreasing the long diameter of the chest. In many of these there appears to be a definite tendency to conglomeration or "balling up" of these areas of fibrosis.

We seldom see effusions amongst silicotics. Occasionally there is little fluid in the sulci but most of them are dry. This is again probably due to the chronicity of the disease, and in spite of frequent colds there is still little evidence of pleural effusion.

At times the transition from one stage of silicosis to another may be rather sudden and dramatic. Where lobar pneumonia has been present in a silicotic considerable scarring or organization may result. The x-ray suggests the possibility of



Massive Silicotic Fibrosis with Infection. Death from sudden pulmonary edema

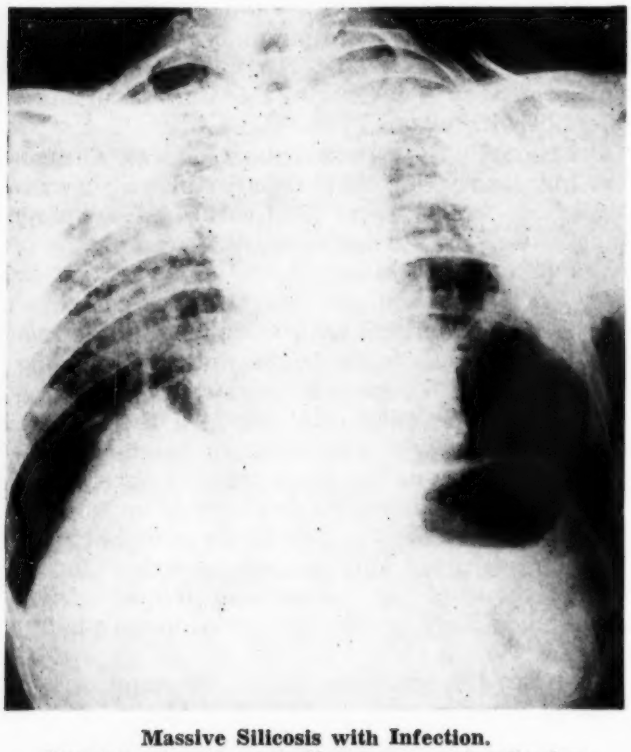


Massive Silicosis with Infection. Illustrating tendency to conglomeration of fibrosis or "balling-up" toward apices

a tuberculous infection but when these cases are followed over a period of time there is little or no change clinically or in the roentgenogram.

AN attempt was made to obtain some idea of longevity in silicotics. Because other factors which might influence the study have been disregarded for the sake of clarity, the findings are by no means conclusive. However, one may get some idea of the expectancy of these men, and the comparison between the two groups is interesting. (Table 9.)

It will be seen that in 41 cases of uncomplicated silicosis with an average underground exposure of 27.4 years and a rock exposure of 4.7 years, 60.9% have reached the age of 55 years or over



Massive Silicosis with Infection. Showing elevation of diaphragm and adhesions with tendency to retraction of lung toward apices

Silicosis with Non-Tuberculous Infection. Postoperative pneumonia and residual pleurisy showing organization. This picture has shown little change in later x-rays

TABLE 9

Longevity in Silicosis
Uncomplicated Cases—41 Cases

Average Underground Exposure 27.4 years
Average Rock Exposure 4.7 years
60.9% have reached Age of 55 years or over
21.9% have reached Age of 65 years or over
9.07% have reached Age of 75 years or over

Complicated Silicosis—50 Cases
Average Underground Exposure 25.3 years
Average Rock Exposure 5.8 years
58% have reached Age of 55 years or over
20% have reached Age of 65 years or over
4% have reached Age of 75 years or over

while in 50 cases of complicated silicosis, 58% have reached this age.

Twenty-one percent of the uncomplicated group have reached 65 years or over, while 20% of the complicated group have done the same.

In the uncomplicated group 9.07% have reached the age of 75 or over as against 4% in the complicated division.

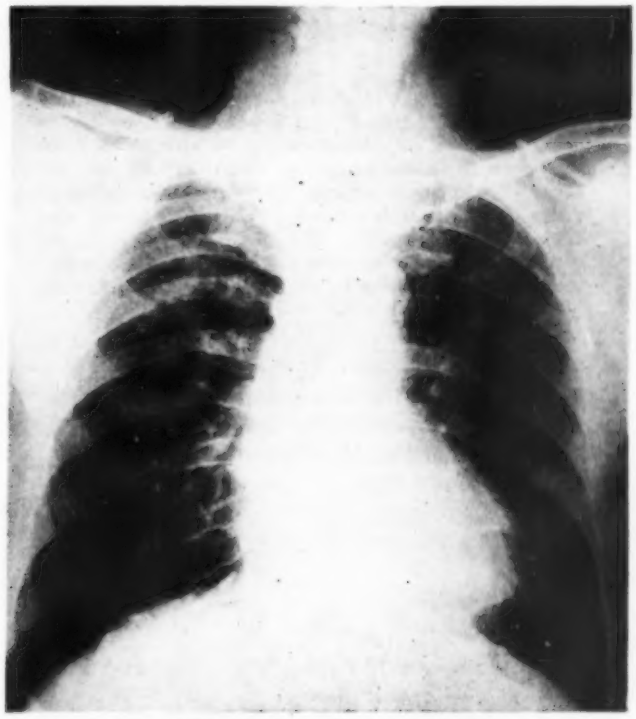
CASE J.B. Aged 73 years. Worked at mining for 20 years in dusty places in raises and rock drifts. Longest single exposure was six months. Used dry drills. Worked as pumpman later. Complains of some shortness of breath and discomfort in stomach after meals. General physical condition otherwise good

As one would expect, the span of life appears somewhat greater in the uncomplicated group but the difference between the two is not as striking as one might anticipate. It must be remembered also, that these men are all living and many will go on for a considerable number of years yet, while some of the uncomplicated cases will develop infection and pass over into the complicated group.

In every mining community are numbers of men who have lived out their allotted span. Many of these people are still very well preserved. They have worked under all sorts of conditions and in different locations, in the days when safety precautions were unheard of. The fact that not a few have reached old age bears witness to the fact that silicosis tends to be a chronic disease and that all persons exposed to a silica hazard do not necessarily become disabled.

Recently I have examined 27 of these old veterans and have found a number with well developed silicosis. In some instances there is evidence of infection as well. All have had lengthy experience in mining and some have done a great deal of rock work. In other cases the amount of occupational fibrosis is surprisingly small considering the length of exposure. No doubt some of this can be accounted for by the fact that probably much of the work in the earlier years was done by hand drills instead of power-driven tools.

The following cases are presented to demonstrate that certain individuals with a well developed silicosis may live to old age without apparent disability. It is probable that they will die from some other condition. The photographs indicate that the physical condition of these men does not differ greatly from that of other persons of the same age in other walks of life.



CASE J.B. Silicosis first degree, with fresh infection in both apical regions

Conclusions

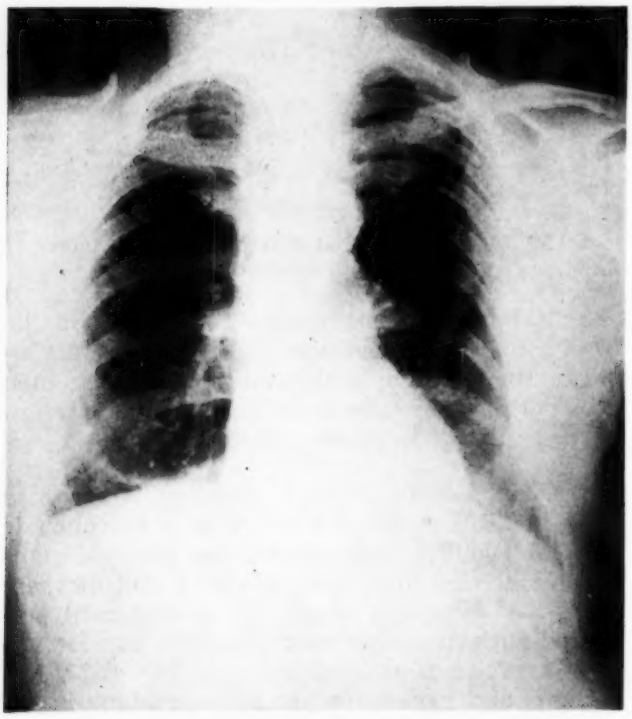
FROM this study it seems logical to conclude that significant symptoms and physical signs in presilicotics and uncomplicated silicotics are few. The symptom of dyspnea is commonly reported but actual shortness of breath, as observed after exercise, is unusual.

Signs and symptoms are more evident in far advanced, conglomerate silicosis and silico-tuberculosis. The presence of infection increases both

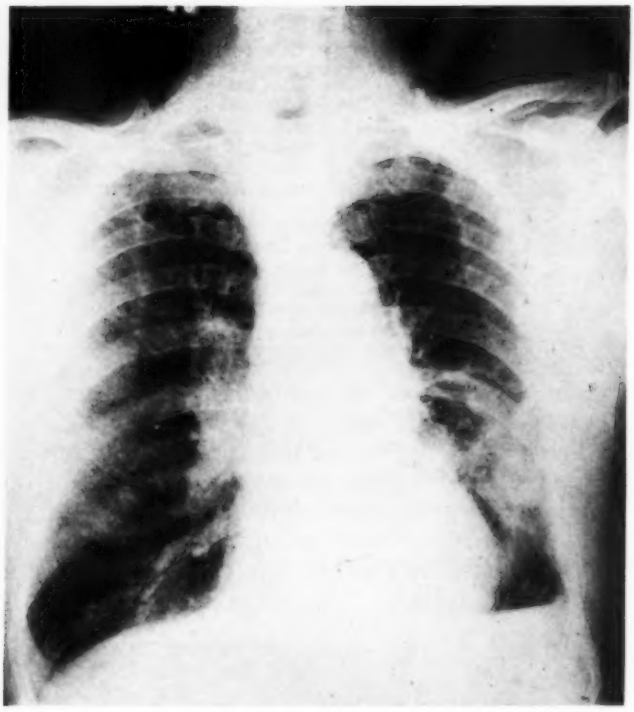
CASE D.H. Aged 71 years. Worked in five different mines in England, tin, copper, etc., mostly in rock. Worked in lead mines in Mexico for a year. Has been in Michigan mines 41 years. In all, has been working in mines for 47 years. Estimated 10 years in rock. Some years ago had empyema and drainage on left side. Made good recovery, and general physical condition at present time is better than many individuals of this age who have no silicosis

signs and symptoms. It is probable that their increase is due to tuberculosis rather than silicosis.

Serial x-rays constitute the best means of detecting the presence of silicosis and infection.



CASE G.K. Definite uncomplicated first degree nodulation. No symptoms



CASE D.H. First degree nodulation with old infection (probably non-tuberculous) and scarring from old empyema drainage, left

Progression of silicosis and activity of infection is best determined by serial x-rays, supplemented by concentrated sputum examinations at least every two weeks in all suspicious cases. Guinea pig inoculations should also be done when indicated.

CASE G.K. Worked in copper mines in England seven years. Went to work in the mine at the age of 11. Used hand drills, wet, at that time. Worked in mines in Upper Michigan for 48 years, mostly ore work, pipe work, etc., underground. General physical condition is very good. This man is 75 years of age.

Chronicity of infection and slow progression of uncomplicated silicosis are the rule in iron ore workers. Rapid development with fatal termination is relatively uncommon in the higher age groups.

Progression of silicosis does not seem to be markedly affected by the presence of infection, except in a very few cases.

The analysis of subjective symptoms and signs in this small group of patients emphasizes their unreliability and demonstrates the necessity of searching for other causes than those attributable to occupation.

The fact that a considerable number of individuals whose roentgenograms show silicotic nodulation, have reached normal old age, demonstrates that the disease is not inevitably fatal.

Discussion:

DR. LEROY U. GARDNER: I hesitate to say anything after DR. HAMLIN'S presentation because he has told you a story that needs little amplification. However, I do want to congratulate him on doing a pretty swell job under difficult circumstances where he is confronted with a community problem of tuberculosis, which makes silicosis more trying than it is in many places.

He has brought out one of the very essential features, and that is the necessity of attacking tuberculosis where it occurs and attempting to reduce the incidence of infection in the community so that the highly susceptible members of the group, the silicotic ones, will not be continuously exposed.

His experience with the von Pirquet test is one which is not uncommon. In attempting to tabulate them statistically, the small number of cases brings out the absurdity of some of the results that have been seen.

I think, nevertheless, that we should not stop trying to find some simple objective test. I want to comment briefly on the tuberculin text. We don't know how to value a tuberculin text in people with silicosis at the present time. They are probably less sensitive to this specific irritant than normal individuals because of the fibrous character of their lesions and the lack of absorption. I believe, however, that when we learn to use tuberculin, we are going to get some information of very great value in enabling us to make up our minds as to whether some of these massive conglomerate lesions are actually due to associated tuberculosis or are due to other infections, or whether there is a conglomeration of the infection itself.

I also make a plea that more people do systematic sputum examinations, as DR. HAMLIN has been doing. That is going to be very helpful in establishing diagnoses. He showed you cases which had been positive in a few instances and later became negative.

I have a museum in Saranac Lake of not a few cases with definite cavities in the lungs — sometimes big cavities. The histological picture is that of typical tuberculosis in which the sputum before death has gone from positive to negative; and in which guinea pig inoculation of the cavity content after death was negative.

In other words, the infection which was present and produced the lesion has subsequently healed and the organisms are no longer there, but the result of their activity persists.

The same thing has been proved by animal experimentation, particularly animals being exposed to mixtures of this iron ore and silica dust.

Just one word about the matter of progression. DR. HAMLIN has called your attention to the fact that progression is very slow. He observes it in comparing frequently the pictures at the beginning and the end of the six-year period, but he is not able to see very much evidence as he follows pictures from year to year.

In South Africa, their experience indicates it takes a man eight years from a pre-silicotic stage to a silicotic one, and a somewhat lesser period of time to go from first to second degree nodulation.

This is a very chronic condition and it is hard to appreciate that it is progressive. The influence of infection on progression is one that, again, is hard to evaluate. Infectious lesions probably determine the localization of silica in certain locations where silica previously exists. When we get a superimposed infection, then the nodules do become larger and do become obviously different. But, in a case where both irritants are working together over a long period of time, it is pretty hard from an x-ray standpoint to appreciate their effect. In studying pathological lesions, however, and studying those produced experimentally in animals, the influence of infection is a definite fact.

The Employability of the Handicapped

REPORT OF THE COMMITTEE
on
THE EMPLOYABILITY OF THE HANDICAPPED
AMERICAN ASSOCIATION OF INDUSTRIAL PHYSICIANS AND SURGEONS

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FLOYD E. SHAFFER, M.D.,
Bethlehem Steel Corporation. *June, 1940*

OUR study has impressed upon us the magnitude, the many and devious ramifications of the problem encompassed by the subject, "The Employability of The Handicapped." Unfortunately, the degree of accuracy which we would like to incorporate into this report is not obtainable, primarily because the number of persons in this country who have an appreciable physical or organic impairment is uncertain, and secondly because the distinction between impairments which are a handicap and those which are not is affected by so many variables and interpretations that the available statistics become quite unreliable. This report is based, therefore, on a number of facts and on several estimates which have been accepted as dependable by those most intimately concerned with the problem.

Factors Affecting the Problem

IN THIS study of the problem of the employability of the handicapped, it was thought desirable to reflect upon:

1. A satisfactory definition of a handicapped person;
2. A census of handicapped persons in the country;
3. A census of employed handicapped persons;
4. The annual increment of handicapped persons in the employable age;

5. The cause of impairments among the handicapped;

6. Various attempts to meet the needs of the handicapped;

7. The employment possibilities for the handicapped; and

8. The impediments to the employment of the handicapped.

Definition

IMMEDIATE difficulty is encountered in attempting to define a handicapped person because it is virtually impossible to find a completely normal person on the basis of present physical standards. It is probably true, as reported, (1) that approximately 90% of all persons in the age group from 17 years to 64 years, the working age, present either a major or minor detectable defect upon physical examination, and that a symptomless and undetectable defect exists in a portion of the remaining 10%. It may be true that only about 7% of all persons in the age of employability are free from organic or functional defect.

It is equally true that obvious or detectable physical or organic defects do not militate against functional activity or handicap employability in an appreciable number of cases. Every man is a law unto himself.

For example, the traumatic amputation of the distal phalanx of the fifth finger, right hand, on a cable splicer has in no way handicapped his progress toward a highly-skilled craftsman solely because he is a left-handed person. Conversely, a Duputyren's contraction in the palm and long finger, right hand, of a work planner is a definite handicap, because it appreciably reduces his ability to write. It would not be a handicap at all if it concerned his left hand. There are many such factors which compensate for an important impairment.

For the purpose of this study, a handicapped person shall be defined as:

"Any person in whom there exists a permanent physical or mental or functional nervous defect or infirmity of at least appreciable degree of severity, whether congenital or acquired by accident, injury or disease."

Such a broad definition would include in its scope all permanent impairments, both incapacitating and non-incapacitating, those which explain total permanent disability, those which introduce a definite handicap for employment, and those which place no limitation whatever upon the individual's employability.

Present Limitation of the Study

IN THIS report the Committee has confined itself to a study of the physically handicapped. It is recognized that there are many persons handicapped in some measure by (1) mental defects, (2) by personality defects, (3) by epilepsy, and (4) by other prominent functional disorders of nervous origin. It is further recognized that many such persons are at present employed, their handicaps sometimes appraised and provided for; sometimes not.

A case in point concerns a worker in a third-line supervisory position, definitely a psychopathic personality, probably schizophrenic, who quarrelled frequently with his co-workers and with his supervisors, assaulted his wife and attempted suicide. Following treatment, he made an unsuccessful attempt again to perform his regular work. He was then reassigned to night hours as a repairman in a garage where he works alone and he has carried on most efficiently and satisfactorily for more than four years, although his abnormal personality traits are plainly obvious.

It is believed that others in these groups might be employed in industry, in agriculture, in the public service or in sheltered jobs elsewhere, if their capacity for work was adequately appraised, and if opportunities for their placement were found available.

Census of the Physically Handicapped

NOT only because a determination of the extent of our problems seemed vital to a proper study of it, but because the search became exciting and intriguing, a diligent effort was made to discover the number of handicapped persons in the nation. In the endeavor:

(a) Personal interviews have been conducted at the United States Public Health Service, The United States Department of Labor (Bureau of Statistics and of Workmen's Compensation), The United States Social Security Board, The Federal Vocational Rehabilitation Bureau, State Vocational Rehabilitation Bureaus and the Metropolitan Life Insurance Company.

(b) Numerous reports and other likely sources of information have been examined.

2. It can be authoritatively stated that no reliable census or completely satisfactory estimate of the number of persons in the country, who at any one time, are handicapped by permanent physical impairments or chronic disease, has ever been made.

This fact is understandable. A reasonably accurate census pre-supposes that all persons who have a knowledge of their physical or organic impairment would report it. That is hardly to be expected because many do not regard the defect as significant and others would fear the consequences of reporting it. Still others are unaware of their impairment, especially in regard to non-incapacitating defects, such as unilateral blindness and first degree hernia, for examples.

3. Over a long period of years, surveys of the physically handicapped have been made in a number of states, by various Commissions, especially for the blind and the deaf and in 1935-1936 by the National Institute of Health of The United States Public Health Service. These surveys justify the following conclusions:

(a) That there are approximately 4,000,000 physically handicapped persons in the nation; 70% of whom are males, 30% females.

(b) Of this number, approximately 1,800,000 are unemployable by reason of age; they are either too young or too old.

(c) The remaining approximately 2,200,000 physically handicapped persons in the nation are in the age of employability, from 17 years to 64 years of age. They represent about 1.6% of the total population.

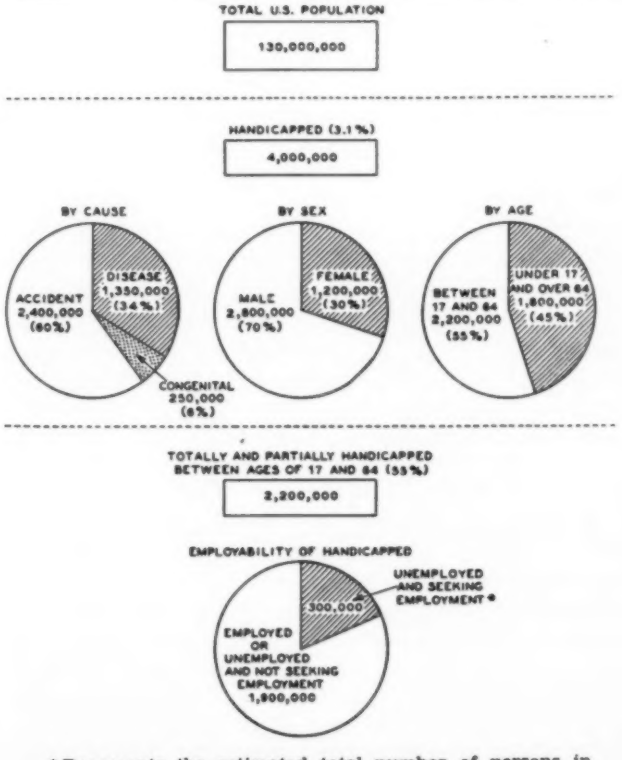
Other studies with reference to handicapped persons, their rehabilitation and employability, regard the working age as 17 years to 55 years. In this study the employable age has been extended to 64 years because it is believed that a workman with a permanent partial disability at age 56 may still have many remaining years of industrial usefulness, and is entitled to re-employment.

(d) Of these 2,200,000 persons, 1,900,000 are either employed, are too severely handicapped to be employable, or are not seeking employment.

(e) Surveys made on various occasions upon various classifications of the crippled and disabled in different areas, reveal wide discrepancies in the percentage of the totally disabled. They vary from 10% to 28%. Therefore, no attempt is here made to guess at the number of totally disabled persons in the employable age group. Similar uncertainty surrounds the number of handicapped persons in the employable age group, such as housewives, who are not seeking employment. These items, after all, may be of more interest than importance in this study.

APPENDIX I

Estimated Number of Physically Handicapped Persons in the United States



* Represents the estimated total number of persons in the United States who are permanently handicapped because of accident, disease, or other cause, who are between the ages of 17 and 64, and are not employed but are seeking employment.

(f) The conclusion is reached that the figure of 300,000 conservatively represents the number of handicapped persons in the country who are in need of self-supporting employment.

(g) Appendix No. 1 illustrates the estimated fraction of the population that is handicapped and employable.

A Census of Employed Handicapped Persons

NO RELIABLE census, comprehensive for the country, of handicapped persons now employed is available. Surveys show wide variations due to employment policies, nature of the industry or type of occupation, labor demand and supply and the cooperation of employer and employee in disclosing handicaps.

What seems to be one of the best of such surveys, California, reveals that 2.3% of nearly 170,000 employed persons in industry were handicapped, while 7.89% of employees in the public service were handicapped. These surveys indicate that 2.6% of nearly 200,000 employed persons were handicapped persons.

2. Effective February 1, 1940, just this year, a procedure has been established under the Wagner-Peyser Act whereby the Unemployment Commission in all the states cooperating with Federal Social Security Board shall make a record of any detectable or visible or stated physical impairment upon every applicant for unemployment benefits and employment. A record is also made of the handicapped persons who are placed in employment and a report thereof submitted to the Social Security Board. After February 1, 1941, therefore, it should be possible to compile a rather comprehensive record of all handicapped persons seeking employment through these state commissions, the nature of their handicaps and of their success toward employment. It is, of course, realized that even in this group, which will undoubtedly be a large one, a great many handicaps will not be reported, because they are not visible or because the applicant will fail to disclose them.

3. A study of the several surveys which have so far been made upon handicapped persons in various areas has just been inaugurated by the Federal Vocational Bureau, so that in a reasonable time some reliable data upon their employability should be forthcoming from that bureau.

4. Whether or not a census of handicapped persons employed at any one time, especially in all industry, is desirable, is an open question. It would, undoubtedly, be interesting and instructive but most likely it would be incomplete. It would require many months of preparation, it would be expensive and its value would be debatable, since it would record only persons who are now provided for and, in the large majority of cases, are performing their work satisfactorily, and only those who are aware of a handicap and willing to report it. It would probably be open to a great many objections from employees performing their work satisfactorily. It would be unlikely to provide any additional opportunities for the handicapped.

The Annual Increment of Handicapped Persons

THE Bureau of Vocational Rehabilitation of the United States Department of Education reports that each year in the nation, 800,000 persons become permanently disabled through congenital defect, accidental injury or disease. At first sight, that appears to be a somewhat staggering figure, but when it is recognized that approximately 35,000 persons are killed each year in automobile accidents alone and that there is a total of 120,000 accidental deaths from all causes, it is less difficult to realize that by all manner of accidents, by disease and by congenital defect, the ratio of seven permanently disabled persons to each one killed, does not appear so unreasonable. The National Safety Council reports that 170,000 permanent disabilities resulted from about 5,000,000 home accidents, and that there were 98,000 occupational permanent disabilities in 1938 among 3,700,000 industrial workers.

2. Of this yearly total of 800,000 persons becoming permanently handicapped each year:

(a) Approximately 600,000 are so slightly or so moderately impaired that their functional activity is not affected, or is reduced so little that they are able to return to or to enter employment.

(b) Approximately 50,000 are so totally disabled that they remain permanently unemployable.

(c) Approximately 40,000 are either under or over the age of employability.

(d) Of the remaining 110,000, about one-fifth or 20,000 are cared for under vocational rehabilitation programs, and a fraction do not seek employment by reason of circumstance.

(e) The indefinite balance, probably 75,000, represents the annual increment of handicapped employable persons who need some form of rehabilitation in order that they may become employable.

(f) Appendix No. 2 is a graphic illustration of the annual increment of handicapped persons.

Causes of Physical Impairments

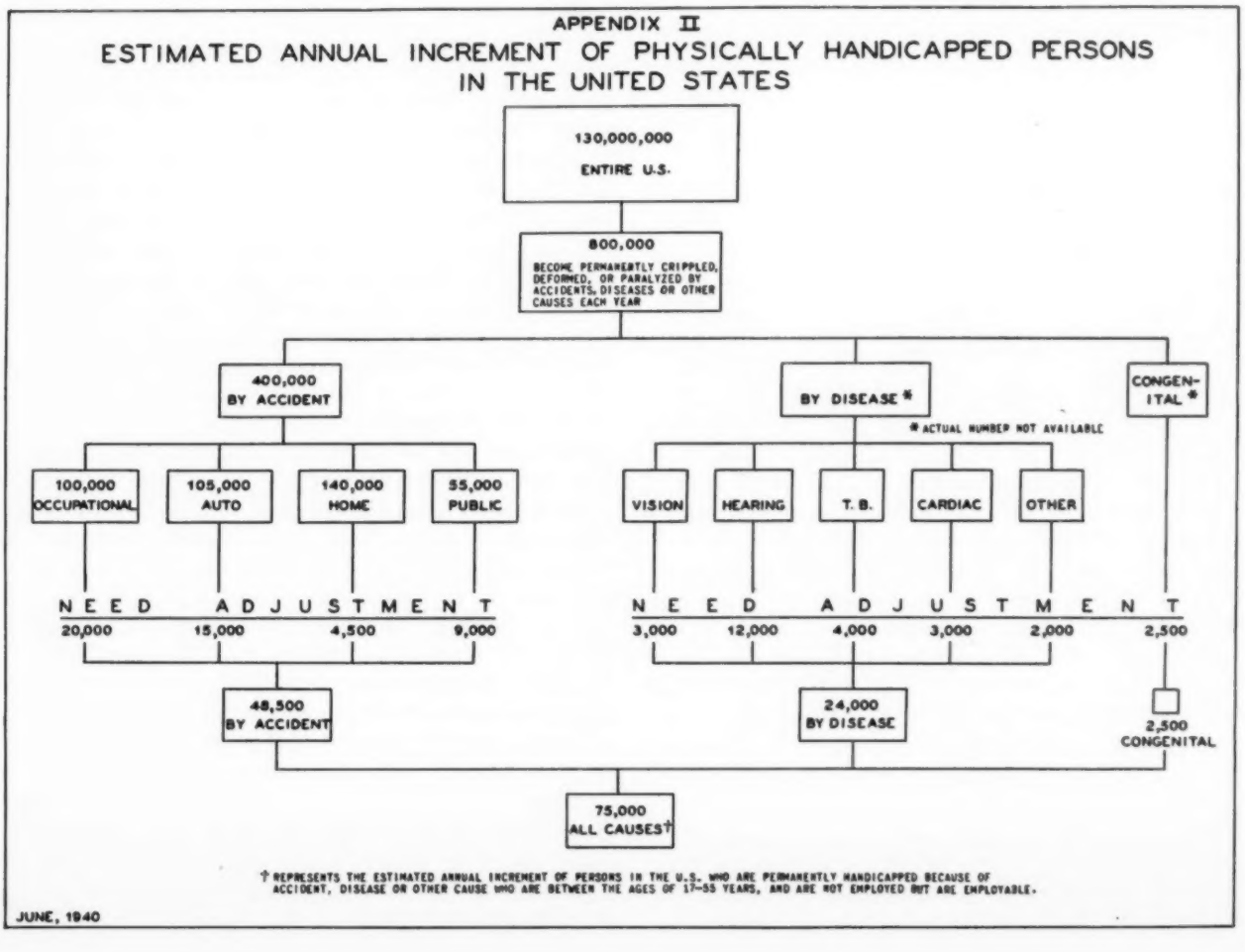
A SURVEY of 312,000 persons, made by National Institute of Health, disclosed the following causative distribution of permanent physical impairments, indicating the damaging effect of accidents:

By accidental injury	61%
Resulting from disease	33%
Due to congenital defects	6%

2. An analysis by the National Safety Council of 400,000 permanent, non-fatal disabilities due to accidents in 1936, revealed the following:

Home accidents	41.4%
Motor accidents	25.6%
Occupational accidents	17.1%
Public place accidents	15.9%

3. While the first surveys indicate that the majority of permanent physical impairments are due to accidents, the second survey emphasizes the fact that a man at work is relatively safe from injury. But these surveys, nevertheless, indicate



that safety movements in industry and upon the highways, effective as they have been, must be sustained and emphasized if the annual increment of handicapped persons is to be controlled or reduced.

That the effort of well managed industry is to protect its men at work is disclosed by these facts. Sixty-one per cent of all handicapped people are made so by accidental injuries yet only 17.1% of all accidents occur in industry.

Attempts to Meet the Needs of the Handicapped

SINCE the beginning of his existence, man has been subject to the disabling effects of accidents and diseases. Recorded history, prior to the nineteenth century, is quite barren of reference to organized or responsible effort to provide for the handicapped or to help him. Crippling defects of any sort were considered to be a part of the burden the individual must bear.

2. The first institutional provision in the United States for the care of any group was for the care of the insane. In 1752, the Pennsylvania Hospital set aside a separate ward for their care. The first hosp.tal devoted entirely to the care of the insane was the Publick Hospital, opened in 1773 at Williamsburg, Virginia. It later became the Eastern State Hospital.

3. Late in the eighteenth century (1780), an English orthopedic surgeon wrote concerning the disabled:

"With the heritage of the ages, it is wise to begin in their education with their treatment; it is wise to begin to build before the mind becomes warped. They have been shunned and restricted in their imprisonment and isolation. Their faults can only be removed by moral and intellectual training."

4. The first institution in the United States for the education and rehabilitation of the blind was the Perkins Institute in Boston, Massachusetts, organized in 1829.

5. It is only in the last 75 years, and principally since the turn of the present century that public opinion has become definitely crystalized as to the needs of the physically handicapped as a group, and that definite and favorably organized efforts, both private and public, have been made in providing adequate treatment, vocational rehabilitation and employment placement for the crippled and disabled. The motivation was not an altruistic or entirely sympathetic one; it was economic. A realization of the fact that institutional or private care of the handicapped was a severe drain upon the public purse and private philanthropy, was the greatest determinant for a new order. Recognition of the fact that it cost from $500 upwards per year to support a crippled or disabled adult in idleness, while his rehabilitation for employment and economic independence could be accomplished for a single expenditure of $300 or less, has been the most convincing argument for rehabilitation of the handicapped.

6. One of the most important factors which hastened the development of a constructive rehabilitation program for the disabled was the alarming growth of the problem. The great expansion in methods of manufacturing by machinery and the speeding up of transportation with consequent disabling accidents, brought about a condition which demanded amelioration, and despite the development of the safety movement, the problem became more and more acute.

7. While it is unquestionably true that for many years, since 1873, progressive and enlightened employers of labor have felt a responsibility for persons disabled in employment and have continued to keep them somehow employed, or provided pension systems for the totally and permanently disabled, such arrangements are not universal, nor stable, nor always satisfactory.

8. Since 1911 all but two states and territories have established workmen's compensation legislation for the purpose of compensating the disabled for injuries received while at work. But experience in the administration of workmen's compensation laws soon demonstrated that money benefits to the injured workmen were not sufficient in all cases to ameliorate their condition or to lessen the effects of physical disability. Compensation benefits in themselves are frequently inadequate since they do not provide a margin whereby the disabled worker can fit himself for employment when his physical disability prevented return to former work, and this objective is limited by the limitations placed upon medical benefits. Few disabled persons are able to adjust themselves to new vocations of their own initiative.

9. In 1917, the United States entered the World War and this action had a significant bearing on the whole problem of the rehabilitation of the handicapped in this country. The European nations had already learned the value of rehabilitating their disabled soldiers, recognizing them to be quite as useful after retraining for specific duties as they were before their incapacitating injuries. In June 1918, Congress unanimously passed, and the President signed, the bill for vocational rehabilitation of disabled soldiers, sailors and marines. In 1921 the Veterans' Bureau assumed the program. The record shows that in 1928 when these rehabilitation activities ceased, 97.8% of the war-disabled who were unable to follow their pre-war occupations and who undertook retraining, were employed. This result is a pertinent suggestion upon the employability of the handicapped.

10. Prior to 1920, 12 states and by 1940, 48 states,* the District of Columbia, Hawaii and Puerto Rico had accepted the provisions of the national vocational rehabilitation act of 1920, which provides for "the rendering of a physically disabled person fit to engage in a remunerative occupation." On June 30, 1938, approximately 119,000 persons had been trained or retrained for and established in self-supporting employment.

11. Assuming as correct the estimate that there are at present approximately 300,000 physically handicapped persons in the employable age group in need of employment, consideration must be

* Kansas has accepted but as yet provided no state fund.

given to the fact that in the last decade a very large number of apparently able-bodied persons, also, have been unemployed. It is probable that with a return of better business conditions or with the speeding up of the manufacture of the means for national defense or implements of war, many of the unemployed physically handicapped as well as of the able-bodied, will be absorbed into industry, much as we may dislike rearmament, because there is much that these persons can do and want to do for their country.

12. An important factor affecting the employability of the handicapped is the individual's attitude toward his problem. It is an obvious fact that a physical disability or organic defect is frequently not incompatible with functional activity or industrial usefulness. Much depends upon the individual's initiative and perseverance, character and intelligence.

The assistant transportation manager of one of New England's largest industries, surgically deprived of his natural larynx because of cancer, has carried on efficiently for eight years with the aid of an artificial larynx. The owner of a large New England lumber mill directs his workmen and merchandises his products with the aid of a similar prosthesis.

"Milton, the blind, who looked on Paradise,
Beethoven, the deaf, who heard vast harmonies,
Byron, the lame, who climbed toward Alpine skies,
Who pleads a handicap, remembering these?"

13. In any consideration of the problem of the employability of the physically handicapped, a tribute must be paid to the amazing achievements of the masters of orthopedic surgery. It has been through the devoted efforts of these men that much has been, and more will be, achieved because orthopedic impairments account for nearly three-fourths of all disabling impairments.

Employment Possibilities for the Handicapped

HELPFUL information regarding the feasibility of employment of persons with specific handicaps is well illustrated in the two tables below. Table I shows the percentage of various handicaps disclosed in a population group of approximately 153,000 persons, while Table II reveals the various handicaps in a group of approximately 5,000 employed persons:

TABLE I
HANDICAPPED PERSONS
in a survey
of 153,000 of general population

Hand disability	7.2%
Arm disability	4.4%
Foot disability	3.0%
Leg disability	16.5%
Back disability	14.0%
Vision defect	11.7%
Hearing defect	5.6%
Heart disability	13.0%
Lung disability	4.7%
Miscellaneous	19.9%
Total	100.0%

TABLE II
HANDICAPPED PERSONS
in a survey
of 5000 employed persons

Hand disability	23.1%
Arm disability	6.8%
Foot disability	3.6%
Leg disability	21.5%
Vision defect	8.5%
Hearing defect	12.1%
Heart disability	2.7%
Lung disability	6.2%
Miscellaneous	12.5%
Total	100.0%

Here again statistics must be taken for what they are worth. But a comparison of the foregoing tables suggests that while disabilities of the hand do not bulk large in the population group, they comprise the plurality of disabilities among the employed group, suggesting either that persons so handicapped are most readily employable or that they are more frequently re-employed because their injury was an occupational one. The large number of leg disabilities in both groups is interesting and suggests that it is not a severe handicap to employment to some extent, due perhaps to the efficiency of artificial appliances. Disability due to cardiac defects is relatively difficult to adjust to employment, apparently. The blind are the most unfortunate group.

2. In a similar manner a survey previously referred to disclosed that among approximately 200,000 employed persons, 2.6% were revealed as handicapped. Since it is commonly accepted that only 1.6% of the total population in the employable age group is handicapped, it would again appear that the handicapped are relatively well cared for.

3. A survey on the East Coast (Massachusetts) discovered handicapped employees in 113 different industries in 149 different occupations. A very distant survey on the West Coast (California) disclosed handicapped employees in 290 different occupations. A national survey recorded 628 different jobs at which physically handicapped persons were employed. It seems reasonably safe, therefore, to conclude that the type of work which properly trained disabled persons can successfully undertake is not too restricted.

4. In 1935 an analysis was made in the State of California of a large number of jobs from the point of view of feasibility of operation by persons disabled in various ways. It was designed to show whether the job could be performed or not by a person with a given handicap, or whether he might perform it conditionally, i.e., if certain adjustments were made in the method of operation or with the aid of some artificial appliance. Twenty-eight classifications of disabilities were selected and 14,460 different jobs analyzed, a total of 404,880 theoretical possibilities in office positions, commercial positions, factory jobs, mechanical jobs, and miscellaneous occupations in about equal proportions.

5. The number of theoretical jobs which might be filled by suitably trained workers was found to be 124,569, or 30.6%, indicating the wide range of job possibilities for physically handicapped persons, actually about three out of every 10 jobs. The detail of this is shown in Appendix 3.

A further analysis of the 404,880 theoretical employment possibilities into five classifications, (1) office, (2) commercial, (3) factory, (4) mechanical and (5) miscellaneous jobs, is shown in Appendix 4. It suggests the most desirable placements for different types of handicaps.

6. Finally, some indication of the actual performance of handicapped persons as compared to that of the able-bodied, may be a controlling factor in the placement of the handicapped. A survey made by a large manufacturing plant, comparing some 685 disabled employes with the same number of non-disabled, revealed:

7.9% more non-disabled workers resigned than disabled;
7.0% more absences among non-disabled;
5.6% fewer accidents among the disabled;
7.4% more discharges for cause among non-disabled;
4.6% increased earnings for the disabled as compared with 4% for the non-disabled.

7. From these comprehensive and enlightening analyses, the suitably trained handicapped individual may well take courage in his search for employment when employment is available for anyone, when employment managers appraise functional capacity rather than the handicap itself and when employers are not likely to be doubly penalized in the event of a second injury.

APPENDIX III

NUMBER AND PERCENTAGE OF THEORETICAL EMPLOYMENT POSSIBILITIES FOR DISABLED PERSONS FOUND BY ANALYSIS OF 14,460 DIFFERENT JOB OPERATIONS, DISTRIBUTED BY TYPES OF DISABILITY

Disability	Feasible	Conditionally Feasible	Total	Percentage
Arm, left, disabled	1,734	1,290	3,024	20.9
Arm, left, off below elbow	2,280	1,139	3,419	23.6
Arm, left, off above elbow	1,667	1,061	2,728	18.9
Arm, right, disabled	1,420	1,401	2,821	19.5
Arm, right, off below elbow	1,871	1,229	3,100	21.5
Arm, right, off above elbow	1,315	1,113	2,428	16.9
Arms, both, disabled	83	74	157	1.1
Arms, both, off below elbow	74	66	140	1.0
Arms, both, off above elbow	73	75	148	1.0
Cardiac	7,934	1,344	9,278	64.2
Deafness, partial	8,187	2,016	10,203	70.6
Deafness, total	2,249	934	3,183	22.0
Hand, left, disabled	1,682	1,319	3,001	20.7
Hand, left, mutilated	3,687	5,622	9,309	64.3
Hand, right, disabled	1,594	1,299	2,893	20.0
Hand, right, mutilated	3,276	5,692	8,968	62.1
Leg, left, disabled	3,953	1,599	5,552	38.4
Leg, left, off below knee	5,503	1,909	7,412	51.2
Leg, left, off above knee	3,705	1,711	5,416	37.5
Leg, right, disabled	3,886	1,555	5,441	37.6
Leg, right, off below knee	5,411	1,847	7,258	50.2
Leg, right, off above knee	3,645	1,634	5,279	36.5
Legs, both, disabled	740	815	1,555	10.7
Legs, both, off below knee	850	888	1,738	12.0
Legs, both, off above knee	718	836	1,554	10.7
Tuberculosis, pulmonary arrested	7,268	978	8,246	57.7
Vision, partial	7,576	2,692	10,268	71.0
Vision, total	14	36	50	.3
TOTAL	82,395	42,174	124,569	30.6

Impediments to Employment of the Handicapped

THE crippled and disabled youth entering the age of employability is doubly handicapped by first, his disability and second, his lack of skill, if he must seek a means of supporting himself at once. Deprived of the opportunity for vocational rehabilitation, he may find employment "through the force of his own personality, through the mild nature of his disability, or through fortuitous circumstance." Vocational rehabilitation and placement, however, have much to offer if he but has the time and opportunity for training. A report by the Federal Vocational Bureau shows the placement of 829 out of 831 children selected for rehabilitation in 13 different classifications of employment. It is fair to assume that under favorable business conditions the majority of physically handicapped children who are not totally disabled, given an opportunity for vocational education and rehabilitation, become employable and are employed. But the work is greatly retarded by an inadequacy of public funds and insufficient trained personnel.

It should be realized that vocational training or retraining for the handicapped must be undertaken within a period of five years from the occurrence of disability, or the arrival of the handicapped at employable age. After that time has passed, the handicapped has probably become adjusted upon welfare relief or accepted

APPENDIX IV

PERCENTAGE OF THEORETICAL JOB POSSIBILITIES FEASIBLE FOR DISABLED WORKERS IN FIVE WORK CLASSIFICATIONS, DISTRIBUTED ACCORDING TO TYPES OF DISABILITY

Disability	Per Cent Office jobs	Per Cent Commercial jobs	Per Cent Factory jobs	Per Cent Mechanical jobs	Per Cent Miscellaneous jobs
Arm, left, disabled	15.7	20.4	4.4	3.6	9.0
Arm, left, off below elbow	32.1	38.6	12.4	12.3	24.8
Arm, left, off above elbow	22.1	23.2	5.5	4.3	12.7
Arm, right, disabled	14.4	20.3	4.3	3.6	8.7
Arm, right, off below elbow	27.4	35.8	12.1	11.9	23.7
Arm, right, off above elbow	18.7	22.3	5.3	4.3	11.7
Arms, both disabled	.2	1.1	....	....	.7
Arms, both, off below elbow	.6	1.3	....	....	1.2
Arms, both, off above elbow	.2	1.2	....	....	.7
Cardiac	94.6	79.0	49.6	44.2	51.7
Deafness, partial	60.6	47.6	89.9	70.9	55.3
Deafness, total	4.0	7.1	43.7	17.9	12.5
Hand, left, disabled	15.2	19.3	3.5	4.9	9.8
Hand, left, mutilated	61.7	86.1	95.7	94.0	85.5
Hand, right, disabled	13.7	18.7	3.2	4.5	8.7
Hand, right, mutilated	57.6	85.5	94.8	93.6	82.7
Leg, left, disabled	50.6	33.1	19.2	13.1	12.7
Leg, left, off below knee	89.8	60.7	44.2	35.5	44.8
Leg, left, off above knee	59.1	35.1	22.7	19.9	21.5
Leg, right, disabled	49.4	32.3	17.7	12.7	12.3
Leg, right, off below knee	89.4	59.9	43.1	35.4	44.4
Leg, right, off above knee	58.5	34.6	20.9	19.5	20.7
Leg, both, disabled	6.9	5.3	1.6	2.5	1.8
Legs, both, off below knee	13.7	9.1	2.5	4.3	3.0
Legs, both, off above knee	6.0	4.3	1.8	2.7	1.7
Tuberculosis, pulmonary arrested	92.7	75.2	33.9	42.0	52.5
Vision, partial	92.4	90.7	86.3	74.9	84.3
Vision, total	.5	1.0	.6	.4	.2
TOTAL	37.5	33.9	25.7	22.6	28.4

a job at greatly reduced wages, or he will become unemployable because of loss of skill, adaptability or loss of morale.

2. While it is true that some, perhaps the majority of industries, take back their injured workers, able to work, and place them in suitable jobs, the practice is not universal. Quoting again from the Federal Bureau of Vocational Education, a study in 1931-1932 showed that only 4.11% of 2,308 placements studied were made by the employer in whose employ the disability occurred. This is undoubtedly an understatement of the fact of re-employment because the Bureau's sources of information do not appear to be inclusive of all or of most industry. Some industries are known to re-employ all their injured workers who recover working capacity consistent with safety.

3. In at least one state, probably others, there is evidence of the reprehensible practice of employers re-engaging an injured workman for a period of one or two or three months and then laying him off on some pretext, but really because he wishes to get rid of him either for fear of an increased insurance rate or for fear of second injury, or because his productivity is reduced. The worker then has, frequently, a difficult time to re-establish himself under workmen's compensation and a more difficult problem to find other employment.

4. A recent study (1939) reveals in fact that in most states, workmen's compensation laws in their operation definitely tend to militate against the employment of physically handicapped persons rather than serving as an aid in their entrance to or re-establishment in employment.

It appears from this study that the lack of provision in some of the laws and the inadequacy of the provisions in others, for the payment of compensation in the event of second injury, has the most damaging effect upon the disabled worker. Under some of these laws, an employer who engages physically handicapped persons may be assuming a double risk; first, in the event a physically handicapped employee receives a second injury, the employer may be held liable for the combined effects of both the previous and the second injury; and second, his insurance carrier, fixing the rates on the so-called "merit" rating system, may raise the rate on all employees. Neither the employer nor the insurance carrier can be entirely blamed for this situation; both are in business for profit and cannot be expected to employ or to insure persons who they fear might be hazardous risks.

The removal of this additional handicap from the physically handicapped person lies in the direction of amending and strengthening the workmen's compensation laws in such a way that employers may employ handicapped workers without thereby assuming excessive risk. The creation of second injury funds under the compensation laws seems to offer the most satisfactory solution for this stumbling block. Only 12 states, (Arkansas, Idaho, Illinois, Massachusetts, Minnesota, New Jersey, New York, North Carolina, Ohio, South Carolina, Utah, and Wisconsin) the District of Columbia, Hawaii, and the United States Longshoremen's Compensation Act, now make suitable provisions for second injury. The other states should do likewise thereby allowing an employer to engage a handicapped person without excessive risk.

5. Since the advent of pre-employment physical examinations in industry, and this applies also and with particular emphasis to the government and most of its subdivisions, the physically handicapped person has frequently found his opportunities limited. While it is true that many industries do not discriminate against the physically handicapped when their proper placement is possible, it is also true that in others the nature of the work is considered to be unsuited for the employment of the handicapped; a supposition not infrequently based on an undervaluation or lack of adequate interpretation of the handicapped person's functional capacity. It is probably true that a more careful analysis of job requirements in many industries would open the door of opportunity to many handicapped persons now excluded, provided of course, that workmen's compensation laws were not destructive of the effort.

6. Not only is the attitude of the employer, attuned as it must be to production and profits, sometimes an impediment to the employment of the physically handicapped, but rather amazingly a lack of charity or tolerance upon the part of the non-handicapped workers is a definite barrier to the employment or re-employment of the disabled following injury at work or elsewhere. It may be predicated upon a poor cosmetic recovery from a disfiguring injury, an aversion for the deformed or an intolerance for the handicapped's reduced capacity for production in a group. These attitudes, while not difficult to understand, are difficult to overcome.

7. Reference was made to the achievements of physically handicapped individuals through their own initiative and strength of character. On the other hand, there are those sometimes less severely handicapped who are definitely employable, and for whom employment is available, who for want of moral fibre, or through inertia or ignorance or complacency, are content to continue indefinitely upon the benefits of workmen's compensation, disability insurance, pension, welfare or other charity. It is an attitude difficult to overcome.

8. Reference has previously been made to the favorable condition of the labor market as an aid toward the employment of physically handicapped persons. Conversely, in periods of economic depression, it becomes an impediment for then all the able-bodied cannot be absorbed.

Summary

NO reliable or entirely satisfactory census of the number of handicapped persons in the population at any one time has ever been made.

2. Estimates prepared from fractional censuses

of the National Health Survey and various State Vocational Rehabilitation Bureaus, and from studies made by the Federal Vocational Bureau, which seem to be the most dependable sources of information, indicate that there are in the nation:

Approximately 4,000,000 handicapped persons, of whom 2,200,000 are in the working age, from 17 to 64 years.

Approximately 1,900,000 of these are either employed, are not seeking employment, or are too severely handicapped to be employed.

Approximately 1,200,000 are employed.

Approximately 300,000 handicapped persons, probably able to work after training or retraining or other adjustment, are unprovided for.

3. No reliable estimate of the number of handicapped persons now employed is available.

A survey of approximately 200,000 workers in industrial establishments and in public service disclosed that the ratio of handicapped workers to the total workers was higher than the ratio of all handicapped persons in the employable age in the country.

4. The annual increment of handicapped persons of employable age requiring adjustment or training or retraining for occupation is approximately 75,000.

5. There is a definite need for sustained and more effective safety and accident prevention movements in industry and upon the highways and in the homes, to control and to reduce the annual increment of handicapped persons.

Progress in the field of public health and in private medical endeavor to reduce the annual increment from congenital and communicable disease must be continued.

6. Marked progress has been achieved in the last quarter century through private endeavor, social agencies, legislation, vocational rehabilitation and enlightened employment practices, to establish and re-establish the handicapped in employment. Especial tribute is paid to the achievements of the masters of orthopedic surgery.

7. The theoretical employment possibilities in industry, the public service and commerce for handicapped persons, are quite numerous.

8. The employability of the handicapped is to a definite degree a psychosocial problem.

9. Liberalization of the workmen's compensation laws in most states to provide second injury funds is required in order that employers of labor may be less hesitant to engage a handicapped person. Liberalization of medical benefits under these laws is also desirable in order that the injured worker may be more suitably conditioned for re-employment.

10. Records required from all State Employment Service under Section 8, Wagner-Peyser Act, June, 1933, which provide for the notation of physical impairments of all applicants for work and their placement, should at the end of this year, disclose interesting information concerning the employment of handicapped persons.

11. Very creditable progress has been made by the several State Vocational Rehabilitation Bureaus in the training, retraining, adjustment and placement of handicapped persons, and more recently by Unemployment Commissions in their placement.

General Conclusion

THE great majority of handicapped persons are so slightly or moderately impaired in functional capacity, or their handicap is so well compensated by their remaining faculties, that they find work or return to their regular employment of their own initiative. The large progressive industries of the country do not discriminate against handicapped persons suitably trained or adaptable for the work. The number of unemployed but really employable handicapped persons in the country, as a group, does not appear to be out of proportion with unemployment among supposedly non-handicapped persons who likewise need employment for their support and the maintenance of their families.

Appendix V

Employment Possibilities for Workers With Various Types of Disabilities

It is apparent that leg disabilities do not constitute as serious a vocational handicap as arm disabilities. Similarly, it is apparent that the loss or disability of both legs is far from being as serious a vocational handicap as the loss or disability of both arms.

Arm Disabilities

In factory work and mechanical work the presence of an arm disability offers a serious vocational handicap. Most employers are unwilling to employ a person with only one arm unless for the comparatively few jobs which require the use of but one. On the other hand, in office work and commercial work arm disabilities, although serious, are not so great a handicap; in fact, it would appear that there is almost four times the amount of opportunity for workers with such disabilities than in factory or mechanical work. It would therefore seem logical to direct the training of qualified persons with arm disabilities toward so-called white collar jobs in which they apparently have the best opportunity to find employment.

Leg Disabilities

In cases of leg amputation below the knee the vocational handicap which results may be overcome to a very large extent. This is indicated by the fact that there are more than 50% of placement possibilities for them in general. In the factory and mechanical classifications of work, however, the theoretical placement opportunities are less. In case of amputations above the knee the handicap is naturally greater and the theoretical placement possibilities are reduced to about 37.5%, with an increasingly less degree of opportunity in factory and mechanical fields.

Cardiac Disabilities

The first consideration in providing suitable work for persons with cardiac disabilities is that the work must be light. As might have been expected, therefore, the theoretical placement possibilities in office work are nearly 100% for persons with such disabilities whereas in factory and mechanical work there is much less opportunity.

Arrested Tuberculosis

Such cases also have the requirement that there shall be little physical exertion in connection with the work performed. It is therefore logical that office work and commercial work hold out the best theoretical placement opportunities with 92.7% and 75.2% respectively, whereas in factory and mechanical work the percentages drop to 33.9% and 42.0% respectively.

Hearing Defects

For the hard of hearing the general feasibility for employment in theory is 70.6%. For office work and commercial work, however, this drops to 60.6% and 47.6% respectively, whereas in factory work the theoretical possibilities are practically unlimited. In mechanical work the percentage of theoretical possibilities is also high, namely 70.9%.

For the deaf the average theoretical possibility of placement is much less, namely 22%. Office work and commercial work offer possibilities only in a few cases. The theoretical possibilities in factory jobs are better, with 43.7% feasibility and in mechanical jobs with 17.9% feasibility. It is therefore obvious that deafness is a much greater vocational handicap than the condition of those who are classified as hard of hearing. It is also apparent that factory and mechanical work offer the best opportunities for those in both classifications.

Vision Defects

For the totally blind there seems to be comparatively slight opportunity for employment. An analysis of the situation revealed in fact that out of 14,460 jobs studied, only 50 were found to be feasible for the totally blind.

For those with partial vision the situation is quite different. The percentage for theoretical placement opportunity is 71%.

Studies on Absenteeism

REPORT OF THE COMMITTEE
on
STUDIES ON ABSENTEEISM
AMERICAN ASSOCIATION OF INDUSTRIAL PHYSICIANS AND SURGEONS

R. R. SAYERS, M.D., *Chairman*,
U. S. Bureau of Mines.
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New England Telephone and Telegraph Co.
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Chevrolet-Grey Iron Foundry.
WILLIAM A. SAWYER, M.D.,
Eastman Kodak Company.
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Standard Oil Co. (New Jersey). *June, 1940*

THE committee recognizes the importance of keeping standard records of industrial absenteeism due to all forms of illness, whether or not occupational in origin. A rational interpretation of such records should indicate the kind of action to be taken for the improvement of the health of the worker, and thus a reduction in the amount of absenteeism should be secured. The value of such records may be stated briefly as follows:

1. Complete records of all sicknesses in the industrial population will define the nature and the extent of the health problems among industrial workers.

2. An analysis will point out excessive amounts of illness in certain industries or departments of industries, which, in turn, will call for detailed epidemiological studies. As a result conditions or substances injurious to health will be ascertainable, leading in most instances to recommendations embodying corrective measures.

3. When workers know that they will be required to report the reason for short absences, it may be expected that the number of such absences will be considerably reduced.

To obtain statistical records which can be used as a basis of comparison, it is essential that the information recorded should contain details on age, sex, color, occupation and cause of absence. Moreover, it is necessary that the total number of employees under observation in each plant be known and these should be classified according to age, sex, color and occupation. With this information the following basic rates may be calculated specific for age, sex, color, occupation and cause:

1. Frequency Rate: Average annual number of absences per 1,000 workers.

2. Disability Rate: Average annual number of days lost per worker.

3. Severity Rate: Average number of days lost per absence.

4. Fatality Rate: Percent of cases ending fatally.

5. Mortality Rate: Average annual number of deaths per 1,000 workers.

These rates as indicated above should be made specific for age, sex, color, occupation and cause. It is clear, however, that such breakdowns would not be meaningful if the number of workers exposed is relatively small. In such instances the number of workers in specific categories, and consequently the absence yield, would be too small to justify the calculation of rates. Thus the remarks as given apply to the situation where the exposure is relatively large. In other words the breakdowns should be carried only as far as the size of the exposure justifies.

The manual developed by the Division of Industrial Hygiene of the National Institute of Health entitled, "A Proposed Plan for the Recording of Industrial Absenteeism," and advocating the punch card as a vehicle for all data on one absence, was submitted to the members of the committee for criticism and suggestions. Much constructive criticism was received which assisted in the revision of the manual. The criticism dealt principally with the practicability of certain parts of the procedure. Reference was also made to the various factors apart from sickness which might influence the calculated rates.

Two members of the committee attended the symposium, "Sick Absenteeism in Industry, its Extent, its Causes and Control," held at a meeting of the Air Hygiene Foundation in Pittsburgh on November 14-15, 1939.* The importance of the subject was discussed from various angles and as a result approximately 20 member-companies of the Foundation indicated their willingness to participate in a study of absenteeism. At this writing plans are being formulated which will assist in the inauguration of such a study.

In addition to the activity connected with the Air Hygiene Foundation the committee must also mention the absenteeism-recording which is being continued by General Motors and that begun by several state industrial hygiene units. The progess made during the year in the matter of the keeping and analysis of sickness absenteeism records is indeed gratifying.

[NOTE: The "Proposed Plan for the Recording of Industrial Absenteeism," by the Division of Industrial Hygiene of the National Institute of Health,* Appendix of this Report, appears in full on pages 486-492.]

* The proceedings of this symposium were published by the Foundation as Medical Series, Bulletin IV.

Pre-employment Examination

Harry A. Nelson,
Director, Workmen's Compensation Department, Wisconsin Industrial Commission

SOME time ago I was informed that certain labor unions have passed rules to penalize members who submit to medical examination, either prior to or during employment. The largest manufacturer in Wisconsin told me recently that no trouble is being experienced as to physical examinations, as men have become convinced that they are used only for good purposes, and that they were not objecting to examinations for tuberculosis and syphilis. In Illinois one union has stipulated as a condition of employment of members in trades involving the hazards of silica that physical examinations must be made. In New York the legislature goes on record and declares it to be the policy of the legislature to prohibit, through every lawful means available, every requirement as a prerequisite to employment which compels an applicant for employment in any occupation involving the danger of silicosis to undergo a medical examination.

These divergences of position indicate that misunderstanding and controversy exist on the part of at least some persons concerning the desirability of physical examinations of employees as a prerequisite to employment or to continuance in employment.

I speak from the standpoint of an impartial governmental agency with which has been lodged by the legislature certain duties. We deal with the relations which exist between employers and employees, and under legal authority and limitations attempt to do that which our laws have concluded is best for both. When I speak of physical examinations, it is from the standpoint of our agency and our function, and what I have to say involves no other considerations except as they may be incidental to that duty which has been imposed upon us by law.

Before the passage of workmen's compensation acts a considerable movement had gained impetus by legislation and initiative on the part of employers to reduce the number of injuries caused by industrial hazards. When compensation acts required employers to answer in benefits to every employee who sustained industrial injury, there was a decided quickening of pace working toward prevention of injuries and a consequent saving of cost.

The Wisconsin statute requires that employers shall furnish employment and places of employment which shall be safe for employees, shall furnish and use safety devices and safeguards, shall adopt and use methods and processes reasonably adequate to render employment and places of employment safe, and shall do "every other thing necessary to protect the life, health, safety and welfare" of employees. Please note carefully the all-inclusive character of that provision. The Wisconsin program for physical examinations finds its entire basis on that statute, which incorporates the broadest sort of foundation for safety as enunciated by this legislative mandate. The law not only imposes these duties on employers, but is remarkable for its imposition of a like and reciprocal duty upon employees.

DIFFERENT interpretations have been given to safety statutes by the courts. They have been construed variously in a narrow and in a liberal manner from the standpoint of employees. Those courts which gave liberal interpretations for protection of workers held that not only was the physical equipment of the plant required to be maintained in a safe condition, but also the workers themselves were to be so chosen, trained, supervised and warned of hazards as to constitute the entire working environment safe in all respects. They have held that as a minimum employees have a right to know what the hazards are to which they are to be subjected—the right to know the ultimate effect of these hazards—the right to choose whether or not to undergo them—the right to know whether a particular employee can withstand these hazards in view of his own physical makeup.

When analysis is made of statistical data covering accidents, it is observed that many of them occur, not because of a failure to guard, not because of hazards of machinery with which employees work, and not because of the physical equipment utilized by the industrial unit. They come because of failure of the human factor. It is said that from 75 to 90% of accidents occur on account of that failure. Years ago the American Medical Association went on record as saying, "Even the prevention of accidents, it is now gradually becoming recognized, is dependent more upon mental and physical examinations and placement of employees than upon mechanical safeguards, shop discipline and safety first crusades." Naturally the tendency has grown to inquire how the unsafe practices and the dangerous situations produced by employees may be eliminated.

Consider the utter absurdity of placing a huge locomotive, awful in its possibility for damage, complicated in its structures, and requiring the utmost skill and attention in operation, into the hands of a person who has lost much of his vision, is partially deaf, and whose hands are crippled with rheumatism. Yet, in a more limited degree and in a less graphic manner, industry is doing that very thing today.

Until industry has cleaned up the unsafe condition which is caused by the use of employees whose physical and mental abnormalities make them unsafe to themselves and others, it will not have accomplished what years ago it avowedly set out to do. Conversely, when industry denies work to employees who could be placed in positions which are safe to them, and in which they would be safe to their fellows, it will assume an indefensible attitude.

Presented at the Twenty-Fifth Annual Meeting of the American Association of Industrial Physicians and Surgeons, New York, June 6, 1940.

Aside from the abnormalities which involve safety in the doing of work, the employee may be unsafe to others who come in contact with him because he has a disease which may be transmitted.

In industrial medicine the greatest emphasis today is upon the subject of prevention—and properly so. From the days of Koch and Pasteur some of the most glorious achievements of medicine have been those of medical scientists, who, by research, study and practice have been able to learn and prevent the cause of disease.

So in industry the wise approach to the safety of workmen is by prevention of the cause of injury rather than by curing the result of the injury after it has occurred. Is there anything more obvious than the fact that occupational diseases can never be wholly controlled without the use of physical examinations?

LABOR organizations have from time to time raised their voices against examinations. The American Federation of Labor has, however, on occasion stated that it does not oppose medical examinations if they are properly conducted and used solely for safety purposes. The protests of labor have not been without foundation. In times past some employers have made invidious use of results of physical examinations to exclude employees with slight physical defects from positions which they might well fit with due safety to themselves and to others. They have used the results of examinations in an attempt to defeat honest claims for workmen's compensation by muddying the water to such extent that the fact of injury has been wrongfully thrown into the field of conjecture. They have dishonestly used findings as a stated reason for separating persons from work. They have failed to study selection and placement in light of physical disability, and thus have relegated admirable human material to the scrap pile in a deplorably wasteful manner. Insurance carriers with myopic activity have, by use of specious propaganda and other methods, induced employers to discharge employees who, although perhaps constituting hazards in some operations of industry, nevertheless are essentially safe and placeable in others. Physicians have lent themselves to the whims and fatuities of employers and insurance companies instead of exercising that care and scrupulous humanity and honesty which the medical profession should always observe. Some physicians have not had sufficient knowledge of job requirements, nor have they considered defects from a point of view of man, job and employer. They have not recognized that many defectives can be employed with safety and without handicap or lack of efficiency. So any program of a governmental agency which sponsors medical examinations must first of all provide safeguards for their scope and use so that neither employees nor employers may be prejudiced by the practice.

Happily but very few employers, insurance carriers, or physicians have been so unenlightened and short-sighted as to carry out these types of practice. The vast majority, and increasingly so, have exhibited sympathy and beneficence, if not always intelligence, toward employees, sometimes even to the point of doing them actual harm by placing them in positions where they should not be.

There have been written into the Wisconsin law several provisions tending to discourage oppressive plans of physical examination and rejection of employees or applicants for employment. It is provided that the advantage of experience rating, and consequent lower rate of premium for compensation insurance, shall be forfeited by the employer who applies an oppressive plan of examination. Many employers, because of experience rating, may have their premiums reduced as much as 40%, so loss of the benefit of experience rating is a serious item to them. Self-insurers are deterred from operating such plans by a provision granting the Industrial Commission power to revoke the exemption from insurance of the employer who institutes them. Insurance carriers may have their licenses to operate in Wisconsin revoked if they "encourage, persuade or attempt to influence any employer arbitrarily or unreasonably to refuse employment to or to discharge employees." A unique provision of the compensation act is that for benefits to one discharged without good reason from work because of non-disabling silicosis, a condition which produces a stigma which makes it nearly impossible for a silicotic to procure work after he has been discharged by reason of silicosis, although not an element of danger in work. His wage loss is just as great as if he were actually disabled, and results as truly by reason of an injury which his employment has produced.

These provisions have already operated beneficially as a deterrent to unwarranted refusal of work and discharge of employees.

Whenever feasible, Wisconsin has proceeded on the theory of education rather than compulsion. Our employers have cooperated excellently when they have been convinced by logical reasoning that certain proposed steps are for the greatest good of the greatest number. Industry has learned many lessons in the last several decades, and is free to admit today that many of the provisions primarily adopted for the benefit of employees have operated with equal or greater benefit to employers.

FROM the humanitarian and economic standpoints, there seems to be good reason why physical examinations should be generally instituted in industry. Actually many employers now conduct examinations, usually with the best of intentions, but often with need for guidance, and for uniformity in procedure and in the use of results. Employer after employer has testified that partial elimination of absenteeism, the accomplishment of placement, and the creation of good

will are well worth the cost of examinations. We must, however, carefully refrain from adopting standards so high as to bar from employment the average man who wants work. Our shibboleth should be: Place every worker who is fit for work, and displace only those whose condition spells danger.

More than two years ago the Wisconsin commission called a conference of interested parties, including representatives of labor organizations, employers, physicians and insurance companies, to consider the possibility of setting up a program of physical examination of employees. As a result of all of these deliberations, the main committee presented a report, following which the Industrial Commission adopted the "Wisconsin Physical Examination Program."

In its foreword to the program, the commission expresses the hope that industry, labor and insurance carriers will sincerely endeavor to follow the plan outlined. The plan is in no way compulsory. It is wholly voluntary. The fact that the plan has been generally approved by representatives of interested parties, leads the commission to believe that it will be widely adopted, and, as experience is gained, will prove effective for its purpose.

The statement of the commission is that all physical examinations are to be made by physicians selected by the employer. Why should the employer select the doctor? First, because the burden of the task undertaken is the employer's responsibility; because he pays for the examination; because the services of a physician who will study his processes and operations are necessary. If there is a grievance on the part of the examined employee, the Industrial Commission, on proper complaint, will cause investigation to be made, and if the grievance is found to be justified, the employer is to cause further examination of such employee to be made by another physician. The report urges that any practice inconsistent with the plan be presented to and acted upon by the Industrial Commission. For such purpose the commission may appoint an advisory committee to be composed of representatives of labor, industry, and of the medical profession. Examinations are to be paid for in full by the employer, and any lost time or transportation expense occasioned by examinations to employees in service is likewise to be assumed by the employer. It is provided that initial examinations of new employees should be made prior to employment if possible. It is recognized, however, that in case of short temporary periods of employment, examinations are not always feasible, and that in other cases there may be uncertainty as to qualifications other than physical fitness, so a test period is provided to enable the employer to learn of the employee's qualifications and to delay pre-employment examination in such cases for a period not in excess of 30 days. It is also recognized that the term for re-examination will vary with different classes of employees, and for different types of work.

The medical subcommittee concluded that a program of this type should be broad in its scope and cover all types of industries. Protection of health and improvement in the physical well-being of the workers was first in their minds. Improvement in the economic status of workers as the result of protection of health is reflected in the reduction of time and wage loss resulting from ill health, and any program that tends to improve and protect the health of industrial workers tends to reduce the incidence of occupational accidents and diseases. In the adult period of life many physical defects arise, the correction of which, if done timely, can prolong the productive life span. It is, therefore, of benefit to labor and industry alike that such correction be made. Intelligent placement of workers in suitable positions can be carried out only with a knowledge of the physical capabilities of employees. Physicians need to study and carry out measures for improvement in health of workers and to assist employers in placement.

With these principles in mind, the committee adopted a report covering scope of examinations, re-examinations and specified procedures for different types of employment. Forms for reporting of physical examination were adopted. In addition to physical examination, laboratory procedures are to include a chest x-ray (flat plate), blood serology for the diagnosis of syphilis, urinalysis for sugar and albumin determination only, and blood examination. The form covers occupational history, present complaints, weight, vision, hearing, teeth, throat, heart (rate and abnormal findings), blood pressure, chest and lungs, abdomen, back, hernia, skin, extremities, reflexes, varicose veins, glands, temperature, sputum (only when indicated), blood count and and sedimentation rate (only when indicated). Special examinations are to be made where indicated in specific industries.

ONE of the remaining scourges still prevalent in our civilization is that of tuberculosis. The disease may be spread to suceptible individuals by personal contact or by secretions from the afflicted person. What would one say of an employer who would deliberately place a person with an active case of tuberculosis at work involving close contact with dozens of other employees? Is it not equally indefensible to fail to discover those active cases of tuberculosis which may be found in numbers of employees, and which can be discovered by examination? True it is that the sort of examination which an employer is able to give and can afford to give will not detect all of the cases of tuberculosis. It will, however, detect the openly active cases from which the greatest danger may be anticipated. Recently much has been done toward eradication of syphilis. The Federal government has initiated a concerted drive on all lines for eradication of this disease. In Wisconsin the state makes the test for syphilis without cost to the patient or his physician. The committee be-

lieved that in a non-infectious stage, syphilis should not exclude an individual from pursuing his trade, but should certainly call for medical control.

Obviously, in industries which present excessive hazards, or where it is necessary to examine an individual to learn whether the hazard to which he is exposed has affected or may affect him, rather frequent examination will be required. In the case of beginning silicosis, where the possibility of involved tuberculosis may be present, examinations need to be conducted at shorter intervals. Where the lung may be affected, x-ray examinations are always necessary.

One of the occupational diseases which today calls for large payment of benefits in Wisconsin is that of dermatitis caused by contact of individuals with substances used in their work. Patch or scratch tests of a rather simple sort will disclose individual susceptibility and dictate placement of such individuals in the sort of work which will not result in one of the many forms of dermatitis which are so troublesome and so hard to cure.

THE program is not to be a static one. It is elastic and by its very terms calls for continued study of specialized processes and of education of physicians to the awareness of the changing hazards brought on by progress in industrial operations. Indeed, to insure success there must be the closest cooperation on the part of medical men and their organizations with labor and industry and unceasing vigilance by all in the discovery of newer and better practices as available. The family physician who will be called upon to treat the employee will be put upon his mettle to acquire the skill and up-to-date knowledge needed for the treatment of his patient.

The subcommittee debated whether or not the report should be supplied in its original form and both to employee and employer. It was recommended that the detailed original examination form be retained by the examining physician for his own record, and that no other similar form be issued to either employee or employer. However, the employer and the employee are to be informed of any defects which are found which may affect the safety of the worker or his fellows in their work, so that the purpose of the program will be carried out as to correction of defects if necessary, and as to placement in positions where the defects may not prove detrimental. The employer wishes only to know whether the employee is physically able to work at certain jobs. If he is adjudged physically unfit, the employer has a right to know the reason. If defects can be corrected, the employer and the employee have a right to know that, so that the worker may, if possible, be afforded work after the defect has been remedied. So the report which is given to the employer and the employee contains a brief notation as to physical defects (other than lungs), visual defects, and, when pertinent, a further notation as to lung examination, with suggestions and recommendations, as may be necessary.

Always it is to be stressed that the employee is to be considered a personal patient and treated as such by the examining physician. The relationship between these parties is that quasi-sacred relationship which should always exist between physician and patient. A detailed report to the employee would lead to confusion and misunderstanding on the part of many workers, and in some cases might produce the neurotic condition which occasionally arises from undue worry over defects which may, after all, be trivial and often correctible. The employee's family physician, however, is entitled to the full report as to findings, so that he may intelligently advise and treat his patient.

The committee concluded that because of statutory provisions it was beyond the commission's jurisdiction to prevent the admission as evidence in a compensation case of any examining physician's report. The use of the report in compensation cases will result in a honest factual determination, and the question of a pre-existing condition, or of aggravation, will be given careful consideration by the commission. No employer or employee and no qualified expert who passes upon compensation claims should ever shrink from the truth or suppress any information which may have a bearing upon the subject in dispute. Use of the report will in no way prejudice the applicant, provided his claim is legitimate, and will, in many cases, assist him in establishing his claim by dispelling doubt as to a previous condition which might be inferentially interjected by way of defense, and which could not be successfully combated by the claimant without the availabiliay of previous findings.

The question of what conditions should influence employment, or continuation in employment after examinations are made, is attended with some difficulty. Largely the clinical judgment of the physician must control, for with him rests the decision of evaluating the physical fitness of an individual. If we follow arbitrary standards too closely we are likely to reject many competent workers who could be placed with benefit to them and to the employer. We must, however, understand the requirements of the job and the limitations of the individual. Many large employers who have successfully instituted examination plans report that rejections are few.

Certain conditions, however, should always disqualify the employee from work, such as active tuberculosis and syphilis in infectious stages, until proof of proper treatment is submitted. It is the insidious character of the diseases and the fact that the micro-organisms which cause them cannot be seen which make them at times more dangerous than more obvious hazards. Syphilis of the central nervous system is dangerous, particularly from the accident hazard standpoint, and persons so suffering should always be excluded from employment, except as it is known that a type of employment is available which will be safe in light of that malady. Obviously those

suffering from highly communicable or contagious diseases of any kind should be excluded from employment until recovery is complete. High blood pressure should exclude from employment only when associated with damaged heart or kidney function, or both, and then only for strenuous work for particular jobs where the safety of a number of persons depends upon good physical coordination of a few. Serious defects of vision or hearing should exclude from employment in any hazardous physical employment, or where the safety of others depends upon the possession of these faculties.

ALL accidents and diseases will not be prevented even by the use of stringent medical examinations. We close plants when the inspector finds machinery so dangerous that potential injury looms. In the same establishment disease and other deleterious conditions of employees may actually produce greater danger, and yet nothing may be done. It is objected by some that if examinations are generally instituted, employers will become "examination conscious." In Wisconsin we have reached the conclusion that the sooner they become so conscious, the better. In every employers' meeting of any size, and at every safety council this question is discussed. It does not give the employer much credit for intelligence to attempt to hide from him the problem with which he is faced. Industrialists are realizing that the maintenance of the worker's health is of more importance than the maintenance of machines, and that a healthy worker, steadily employed, or a sick worker, quickly restored to health, means more profits for the industry.

Necessarily the medical examiner will have to become expert to a degree as to processes and jobs in order that the results of physical examination can be used to the best advantage and without detriment to employer or employee. The cost of examinations will have to be made sufficiently reasonable so that it will not be prohibitive to employers. The principle of volume must be recognized. Life insurance examinations are given at reasonable cost, and yet act to protect reasonably millions of dollars of reserves. Employers will need to be educated to the understanding that the economic good which will result to the employer will richly replay the cost of examinations.

The program which has been adopted is far from perfect. It is open to modification and amplification as often and as much as required. So far as is known, this is the first venture of this nature presented by a public agency. The commission hopes that through engineering control and the medial control outlined in the plan, Wisconsin may achieve first rank nationally in occupational disease prevention and control, as it has in its industrial accident prevention program. With the modifications which experience may suggest, we hope that the plan will result in increased prevention of accidents and disease, in a happier placement of employees in work, and that it will redound to the greater social and economic good of employer, employee and the state.

Discussion:

DR. J. J. WITTMER, (Director of the Personnel Department, Consolidated Edison Company, New York): I cannot too high congratulate MR. NELSON on a fine and masterly presenation of this much discussed subject of pre-employment examination. He has presented it frankly; in a very new light; and in a unique manner.

I think we all are definitely convinced that pre-employment examinations are necessary and are wise. I think we all have had some connection, frankly, with the quibbling and the rather on-the-fence attitude of most state labor bodies, wondering whether they should come out for or against pre-employment examinations, swayed possibly by many reasons.

But here we have a state that has taken the bit in its teeth. It recognizes the necessity of pre-employment examinations; recognizes the fact that an industry can only be conducted in a safe procedure, a safe way, by pre-employment examinations; and only lays down in its cooperation with industry and with labor the method of precedure, the conditions under which they are to be conducted, and the results worked out.

I have nothing new to add to MR. NELSON'S paper. I would, however, like to emphasize one or two points.

MR. NELSON brings out the attitude of the unions toward pre-employment examination. I think that can be much decreased by the industrial doctor's attitude in the examination. I can not conceive of an industrial doctor or any doctor in collusion with an employer in order to use that as a means of excluding some man from employment. I certainly hope that does not exist.

But, I think that an examination done in a rather sloppy manner, or notes put down in a sloppy or quick manner may lead people to feel that something of that kind exists and can, of course, lay us all open to criticism.

I need not emphasize that a real examination — real notes made; deformed parts noted; scars noted and their location — not only is an impressive condition but it leads to a better record which can be used at a later date.

I don't like the term "pre-employment examination." I would rather see us use the term "pre-placement examination." I think all of us in the past have laid down a series of rules and regulations, causes for rejections. A man shall be rejected if he has this defect or that defect. You can't employ a man with poor vision; with poor hearing; with enlarged or pussy tonsils; abscessed teeth; and so on.

I think we are all wrong when we use that kind of order or regulation. Rather, we should think in what job we can place a man with this defect or with this condition.

I also think we should remember there are a great many conditions we find in pre-placement examination that can be corrected by the man within a very short time after he is employed. For instance, if we have a certain weight regulation and the man is 10, 14, or 20 pounds under weight, if he is given a job and has a chance to eat, he would soon make up his weight. If he has large, pussy tonsils and is given employment, an income, he will be able to have his tonsils taken care of. The same is true of teeth and a lot of other things.

I would like to feel when we are examining a man for employment that we present on one side a picture of a man looking for work, let us say, with certain defects; and on the other side a job, which is really a frame into which the picture must fit. Just because this picture doesn't fit this frame, does it mean that the picture must be thrown away?

Rather than that, I think it means that we must get some other frame into which the picture will fit. We will have a lot more employed, a lot more happy people. I think our whole situation will be less open to criticism, and I think we will have better employment and a better safety situation.

DR. VICTOR G. HEISER (Consultant, National Association of Manufacturers, New York): After the very clear presentation that MR. NELSON gave of the desirability of physical examinations, it is rather hard to understand why there should be any objection to it. But, here again, as in so many other instances, I feel that the medical profession has only been looking at one side of the problem. We have been looking upon the details of how to make this examination without considering the social implications.

I had occasion two weeks ago to serve on the committee that the Secretary of Labor had called to consider the question of physical examination. Madam Perkins, in opening the discussion, said the Department of Labor was simply flooded with complaints from labor organizations all over the United States protesting against physical examinations.

She said her experience in the State of New York as labor commissioner, and later in her present position, had led her to question the need for physical examinations except for such specific occupations as, we will say, pilots of airplanes; possibly contagious diseases; and a few other minor things.

She said on the whole she believed people ought to be allowed to work if they wanted to. That was their responsibility. If they fell over dead on the job, that was their responsibility and it didn't concern anyone else.

That was her view and attitude. Apparently that view also obtains in other agencies of our government in spite of the fact that if there was ever anything clear it is that if we are to make any progress in the control of disease, we must know what the problem is.

Now, labor objects — at least, the labor leaders object, very violently to physical examinations. During the meeting at Washington, I had my first opportunity to hear labor present clearly why they object to physical examinations, as presented by the A. F. of L. representative, Mr. Wallace.

He stated they objected to examination because they felt it was being constantly used by employers to prevent men from obtaining jobs; that the only way that physical examinations could be made acceptable to labor would be to have the examinations done, not by the physician of the employer, but by some public, neutral, independent agency.

He said, second, they objected and would continue to object until government or some other responsible agent made it clear that the unemployable person would be taken care of.

Those were the objections on the part of labor. They apparently are willing to sacrifice all the advantages that come out of physical examinations in order to gain an advantage for the very few. In discussing the matter later with some of the labor representatives, they freely admitted that they were simply using this to obtain another advantage for labor; that on the whole they really felt that physical examinations were very good and ought to be conducted; but they were going to use every avenue and every means that they could lay their hands on in order to prevent physical examinations until those two conditions were assured to them.

It was quite a surprise to them when later evidence was brought out, as shown by sampling surveys, that 95% of all those who are physically examined are approved for employment. Only 5% are rejected. There really could be no great objection to physical examination at the present time because we still have some millions of unemployed.

It seemed to some of the speakers that to allow those who were well to work and allow the handicapped to go on relief and be cured of their defects was better; that seemed to be a sound, sensible way to go about the problem.

One other criticism has been made, also by official bodies, against physical examinations. They say the medical profession has no standard for rejection; that there ought to be set up standards for rejection or for placement.

What is a man fit for? What can a man do who has a cardiac lesion? What should he do? How are you going to rate that cardiac lesion? What ought you to do about a hernia? What about a case of epilepsy?

They say the medical profession is completely without standards and no one can state just where the rating should be. In my judgment, that is a reasonable objection. I hope that we can, as a medical profession, get together and decide.

One knows perfectly well you can't lay down a set of hard and fast rules, but you can indicate principles that will probably serve for the various phases and the various conditions that are going to arise. It seems to me that the Industrial Section of the American Medical Association should be the body to do this. I should say, in the first instance, this organization ought to be the one to do it. But, we only represent a small part of the medical profession, and as a large part of the medical profession is going to be concerned in physical examinations, it seems to me the logical place to have this broken down and the rating done would be in the Industrial Medicine Section.

I hope I have made this matter clear. You see, we always forget that medical problems have social implications. If we are to assure the continuance of physical examinations, we have to go back just a little bit and help educate the public. As I see it, there is a decreasing amount of objection against physical examination. As you go westward, the objection increases; in the east there is very little. It is seldom that you have any serious difficulty with physical examination in the east; but, as you go west, as MR. NELSON pointed out in his paper, there are some labor organizations that actually fine their members anywhere from $10 to $25 if they allow themselves to be physically examined.

That shows how seriously labor takes these physical examinations, and how necessary it is to bring about a much better educational program than we have followed in the past.

MR. NELSON (closing): DR. HEISER brought out some very important points. It seems to me that the doctors should try to find work for men instead of trying to exclude them from work. I don't mean to say they haven't done that, but I think that is the big point we have to keep in mind.

We examine our man and we try to find a job for him rather than trying to find some reason for not putting him to work. I think that is the newer conception of all surgeons, especially industrial surgeons, who make the examinations. With that conception in mind, I believe labor is going to lose its objection to a large extent to examinations of their members. They are losing it now, I believe.

In Wisconsin we have accomplished that to some degree by the fact we have several protective laws that have teeth in them and they make it expensive for those employers who are shortsighted enough to conduct oppressive physical examinations.

If the other states will follow along with laws of that sort for the protection of both the employer and employee, this objection will be removed and physical examinations will come into better repute.

An Appraisal of Vision

—*in Industry*—

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THE physical requirements that industry of necessity sets up for its human staff to meet are rapidly changing, and are increasingly linked to aptitudes of mind and body. Of these, *visual* performance is being scrutinized in person-

nel and training departments in the study of production statistics (rates and efficiency) as well as for safety and compensation records. The first industry, forced by its life and death problems to focus attention on vision, was that of aviation, which reported that 50% of the applicants rejected for physical defects were rejected on the basis of failing to meet *eye* requirements. Walker Polokov, in his book, "The Power Age," states that, "the labor specifications for any really modern industry are expressed in three terms: (1) sustained attention, (2) correct perception, and (3) quick reaction, and only the most competent will be useful in industry." It is because visual *performance,* or "Eyes for the Job" as the slogan has evolved, has superseded the mere recording of acuity that we have undertaken to study the appraisement of vision in industry on all fronts and from all angles.

In order to ascertain an individual's visual *performance* one has to use:

1. A technique that is based on a binocular test, i.e., each eye separately can be perfect, but used together can be 100% unequal to the job.

2. A technique that is rigidly controlled and standardized—laxness and variation lead to unfair and inaccurate criteria—(one plant thought they had high visual admission regulations and discovered on visual survey 15.5% of their employes had *serious* eye defects).

3. A technique that includes in one battery of tests any and all data needed for any job, (the constant shifting of employees requires complete records on each individual at the time of first admission examination).

4. A technique that is interpreted on the basis of the job and reinterpreted, from original records, whenever transfer is made to special jobs such as crane operators, assorters, inspectors, engineers. The standardization of specific visual requirements for special jobs is being made and adopted.

What does a battery of tests giving data from which to classify a person's visual performance consist of? It consists of four basic items:

1. Binocular acuity of each eye separately where patient is unable by trick or faulty illumination or haste of examination to register anything but his actual vision in Snellen equivalents.

2. Color deficiency (and as part of this investigation we recommend the abolition of the word color *blind;* there is a *graded* color deficiency paralleling a *graded* acuity). Such a deficiency is of special importance for people using signals, following colored electrical wires, matching and inspecting, and so on.

3. Depth perception: This is an important matter of record when making a survey of a plant as accident correlations, and so on, can be checked and dangerous jobs controlled. On admission examinations of a *new* employee a lack of depth perception should disqualify for jobs of crane operators, tractor and truck drivers, machinists, and so on. (Much injustice has been done the man who has worked on a crane for 15 years without accident. He has substituted new values for his lack of stereopsis. He has often been taken off because he was found to lack depth perception without consideration of other factors.)

4. Muscle imbalance: Here it is necessary to explain briefly a factor all too little understood, and of tremendous importance especially in an industrial community. Most of us, if our eyes tire reading or concentrating on fine work, can shift and do something else for a while, — an inspector, an assorter, a comptometer worker, an engineer at a drafting table, a girl looping hose eight inches from her eyes, have their bread and butter tied up with eight hours' *constant* close work. He or she *can't* leave it and he or she must do it well, i.e. production rates and pay envelopes are involved, to say nothing of comfort. Here the coordination of binocular vision, accommodation, and the equal play of two pairs of six extraocular muscles must function smoothly or all the perfect acuity in the world will not help. This is demonstrated by a recent patient who came in with 20/15 vision, no refractive error, a pocketful of glasses and as much headache, blur, fatigue and trouble as he had when he set forth on his weary trek seeking relief. A person with a divergence excess, or convergence insufficiency registers a marked muscle imbalance for close, and an equal amount of trouble for close. A person with a convergence excess or a divergence insufficiency has an equal amount of trouble for close—these people are in real trouble when their job is dependent on systematic close effort. In aviation *all* applicants with phorias (muscle imbalances) are rejected until fully corrected because here is the added factor of a marked increase occurring in the phoria with every foot of altitude obtained, so that the individuals can go into an actual squint 10,000 feet up. Nobody would willingly travel with a suddenly cross-eyed pilot. So also in industry all applicants with marked phorias should be rejected till corrected, and in young people especially, orthoptic training after the proper refractive corrections are made, has excellent results.

SOME of the general findings revealed in the survey conducted to date present the following:

1. Acuity defects (individuals with defects) range from plants having 14.8% as the lowest to plants with 38% as highest.

2. Acuity defects uncorrected from 6.2% as lowest to 33.3% as highest.

3. Depth perception has a fairly uniform average, 15%.

4. Color deficiency, 6%.

5. Muscle imbalances (second only to serious acuity defects in importance in visual performance) averaging around 25%.

In other words, there are in *our* industries here in the Calumet area out of the 16,000 odd individuals checked to date:

1724 employees with low visual acuity uncorrected (20/40 or less);

3157 employees with a disturbing muscle imbalance.

These then form a rehabilitation problem if one wants to avoid intraplant dislocation, while revised standards of admission will prevent further problems.

Management understands the importance of visual correlation as evidenced recently in the reception given to Colonel Tuttle's excellent paper on "The Selection and Maintenance of Personnel in Industry," before the Personnel Management Institute at Purdue this spring. At this same conference industrial management voiced its opinion that "we do not approve or accept ready made programs. They must be tailor made." By this they mean that information relative to physical defects and aptitudes must be interpreted on the basis of more individual scrutiny of the job itself, and practical needs of specific industries as such. Visual performance standards for crane operators, working at a distance of 100 feet, differ from those of a girl in the hosiery industry, working at eight inches from her eyes, eight hours a day. Management does know that a simple acuity test as such is totally inadequate information for these differentiations.

The *employees* increasingly understand and expect an evaluation of their visual performance, which will both safeguard their eyes per se and equip them with requisites of their jobs. Visual performance is a factor in merit ratings which partly control promotion, rate of pay, and so on in several large plants in this region. Some of the problems of general company doctors versus company ophthalmologists are illustrated by the following case: A man taking his admission examination was told he had 20/25 vision and was told to get glasses. He did, and brought his vision to 20/20 and his performance record to normal. He reported back to the company doctor who told him, "These glasses are no good. You see about the same without them as with them." The patient was turned down by two companies, a third admitting him without bothering about a vision check at all. The patient returned to us and told us the story of how he was told he did not need glasses with conflicting medical opinions. He has a myopic astigmatism and while he does see practically the same without as with his glasses he nevertheless does need his refractive error *corrected*. This all had to be explained to him by someone, as the *patient* knows his work requirements. Just as unfortunate is the careless, and I am sure, never willful statement made by the employment office in industry and by company doctors when an applicant is found to have low vision in one or both eyes, "Go get some specks and then come back, and see if you can pass the test." That applicant then has been given the definite impression that *any* visual defects can be and should be corrected by glasses, and if any of you have ever tried to explain to such a man who has an amblyopic eye or a retinitis, etc., or a squint, why glasses cannot help him bring his eye requirements up to passing, you will understand how we at the correcting and helping end hope that that applicant be more accurately instructed and be told, "You have a loss of vision or an eye defect. I'd suggest that you find out what is the matter, and if it can be corrected or improved in any way come back and we will try the tests again."

It is my sincere and honest belief that industrial medical people should keep *ahead* of management in their knowledge of progressive practical services and the setting of standards necessary and useful to the industry as its intricate technical processes change. I for one, would feel very much embarrassed if management came to us and said, "You know in the du Pont industries, in the Chicago Elevated Railroad, in the Talon Zipper Corporation (who have been focusing attention on this type of visual record for years) they do so and so. Why as company ophthalmologist do you not give us the advantages of modern techniques in eye standards, etc?" Our understanding of service to industry includes not only the injured man with an intra-ocular foreign body, not only sewing up torn eyelids, but also knowledge of eye standards in general and visual requirements for special jobs, which we feel are as integrally a part of an industrial ophthalmologist's service as a study of new poison threats, new dermatitis types, new physical hazards are a part of the service rendered by the industrial surgeon to his company. To quote Colonel Tuttle, "My background of experience prompts me to hold firmly to the conviction that industry in general cannot emphasize too strongly the importance and value of satisfactory visual efficiency and the adaptation of 'Eyes for the Job'."

Practical Points

—*In the Diagnosis and Treatment of Fractures of the Upper Fourth of the Humerus*—

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IT IS not the purpose of this brief discussion to go into the details of pathology and treatment of all injuries of this region, but to present to you some of the most important facts that should be kept in mind in the diagnosis and care of these injuries.

In examining an injured shoulder, the patient should be stripped to the waist and the normal shoulder examined first, to detect any abnormal peculiarities of the patient. The elbow should be flexed and held firmly in one hand, while the thumb and fingers should grasp the top of the shoulder and include the acromial process of the scapula, clavicle and coracoid process. When these are found normal, the head of the humerus should be gently but firmly grasped between the thumb and fingers, to detect any deviation from normal, or any crepitus. Gentle and slow pressure or

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manipulation should be used to avoid muscular spasm.

The head of the humerus should be examined in the axilla. Rotation of the elbow will determine if the head rotates with the shaft. If any crepitus is detected, it must be remembered that joint crepitus may be present and no fracture. Both may occasionally be present. The experienced surgeon may readily differentiate them. It is confusing to the inexperienced surgeon. I illustrated the difference before a court and jury thus: If one has two rocks of a given shape and surface smoothness, and two heavy wooden blocks of the same shape and surface smoothness, and the two rocks are put into a gunny sack and the two blocks into another, any practical individual can tell which are the rocks and which the blocks, but the difference is difficult to explain. There is friction of hard surfaces in each, but they differ.

Impacted fractures, if not markedly displaced, often can not be diagnosed by careful physical examination. The higher the fracture, the more frequently the impaction and the more uncertain the diagnosis by physical examination only. Careful x-ray stereoscopic films may be necessary.

Epiphyseal separation may occur between the ages of six and 20, and most frequently between nine and 16 years. The three centers of ossification of the head and tubercles join at six years of age, but do not unite with the shaft until 18 to 20 years of age. After this age, epiphyseal separation rarely or never occurs. The epiphysis is not strictly transverse, but rather cup or saucer shaped, with the deeper part extending towards the head. This should be kept in mind when making a reduction.

Fractures of the anatomical neck rarely occur, except in old people. They are often comminuted.

In early adult and middle life, fractures at the surgical neck are most frequent. This group of fractures are between the epiphysis and the attachment of the pectoralis major to the humerus. To the upper fragment and anteriorily are attached the upper part of the latissimus dorsi, the subscapularis, the supraspinatus, and the long head of the biceps passes through the capsular ligaments to its insertion to the tuberosity at the margin of the glenoid cavity. Posteriorly there is the attachment of the infraspinatus, the teres minor and the upper portion of the lateral head of the triceps. These attachments, with their varying functions, usually cause displacements that can be recognized by physical examination. The influence of each must be evaluated in reducing the fracture. Deformity and crepitation are usually present. Impaction without deformity is rare. Comminution is less frequent than fractures of the anatomical neck or the tuberosities.

Fracture of the great tubercle is often complicated with comminution or other fractures. Accurate adjustment is important, for the reason that mal-adjustment and excessive callus may impair the function at the acromial joint. Fracture of the lesser tuberosity seldom occurs alone. Exact reduction is not so essential as the greater tuberosity.

Dislocation is not infrequent with any of the fractures of the upper end of the humerus, and is a serious complication. Reduction is imperative. Open operation may be necessary, but should not be resorted to until every effort at closed reduction has failed. Recent dislocations may be very difficult to reduce, and all old ones present a difficult problem. Dislocations may be easily overlooked, and may require careful stereoscopic films, though usually the head of the bone may be felt in abnormal position.

Practically all fractures of the upper humerus should have x-ray examination. Often the swelling and pain are so great, physical examination cannot be done completely, or satisfactorily.

It has been my personal observation that in dislocations of the head of the humerus of each variety, the active or passive motions are more limited and cause greater pain than fractures only. The patient keeps the lower arm more rigid and guards any movement more completely.

THE treatment of these fractures may be very simple in some or very difficult in others. Epiphyseal separation when completely reduced requires little treatment. The arm with a pad in the axilla should be fixed comfortably to the side by bandage, and the forearm placed in a sling. The same dressing is suitable for fracture of the lesser tubercle.

Reduced fracture of the anatomical neck is dressed similarly but requires also a protective cap for the deltoid region and firm fixation to the side. The V-shaped pad for the axilla should be fixed to the chest with adhesive, so it cannot slip to the front or back of the arm.

Fracture of the surgical neck often requires complicated dressings and possibly confinement to bed with pulleys and extension. The aeroplane splint with extension is probably the most comfortable dressing of this class. Plaster of Paris dressings may be used for the same position. The complicated fracture bed with overhead pulleys and extensions is excellent, but is not best except when the surgeon, interns and nurses are familiar with its use. Ordinary splints and fixation to the side are not usually satisfactory.

Fracture of the greater tuberosity is often displaced upwards, and is difficult to replace to its attachment. If it cannot be brought to its position on the bone, the bone must be brought up to the fragment. This can be done by complete abduction from the side with outward rotation, with the elbow fully flexed, and the hand well by the side of, or at the back of, the neck. If letting the arm back to normal position displaces it again, it must again be reduced, and so fixed with a clove hitch around the hand, and looped around the other arm at the axilla.

Impacted fracture of the head and bone just below should not be displaced or broken up, if alignment or displacement is not too great. The great

mobility of the scapula, clavicle and entire shoulder will offset much imperfection of the bone. In such injuries, careful passive motion should be used as soon as the inflammation and muscle spasms subside. Active motion should be used after about three weeks.

SUMMARY: The important points in this discussion are:

1. Careful physical examination of the normal shoulder should be made for comparison.
2. Systematic examination of the injured shoulder should be made.
3. One must be sure the head of the humerus is not dislocated. If physical examination does not reveal a dislocation, careful stereoscopic x-ray should be made.
4. If the greater tubercle is displaced upwards, it must be reduced. If it cannot be reduced downwards, the shaft must be abducted and brought up to the displaced tubercle.
5. Fracture of the lesser tubercle and epiphyseal separation after reduction need little after-treatment.
6. Epiphyseal separation occurs between six and 20 years.
7. Fracture of the anatomical neck rarely or never occurs, except in the aged.
8. Often an incomplete reduction will secure good functional result if the greater tubercle is not left near the acromial process, for the reason that the entire shoulder is capable of great movement.

Industrial Medicine

—And Its Relation to Peripheral Vascular Disease and Injury—

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THE industrial significance of diseases and injuries of the peripheral blood and lymph vessels is just beginning to be realized by the interested public, physicians, employers, insurance carriers and workers. Problems requiring very careful study and considered judgment are constantly presenting themselves. The decision as to the effect of trauma or pre-existing or impending vascular disease often taxes our total available resources for the drawing of correct deductions. It is hoped that the following suggestions will help to clarify some of the issues in the light of our present knowledge.

General Considerations

ALL injury of measurable degree results in disturbed circulation of the blood or lymph systems or more usually both. The significance of the results depends on the type, degree and site of the injury. This statement is so obvious that it hardly needs dilatation. Inevitably if the site is such that major vessels are involved and the degree of damage is severe, the effects will be serious as compared with slight and superficial trauma — the exceptions being where unpredictable infection or other complications enter into the picture in the presence of slight injury.

A second factor of importance is the general constitutional make up of the patient. This is especially important in vascular disease since many of the findings are largely subjective and in certain instances the objective findings are not in accord with the complaints of the patient. In certain individuals the objective findings are slight while the subjective complaints are very severe. Less frequently we encounter individuals who show objective evidence of marked circulatory impairment with few subjective symptoms.

It has been shown that, quite apart from neurasthenic phenomena, different individuals have a marked variability to endure pain and the same individual may vary from time to time. Peripheral vascular syndromes present excellent examples of this variation and in addition, in some instances, like low back pain, offer unusual opportunities for malingering.

A careful and complete work-up of the entire vascular system will frequently reveal the presence of an underlying cause or hidden area of vascular involvement quite apart from the site of the injury, thus preventing the physician from making a serious error in appraising the problem.

An example of the extent to which one must sometimes go to establish a correct diagnosis is well exemplified by the following case recently studied for the Industrial Commissioner of the State of New York. The technique of study used was devised by Dr. Milton Peterson and myself, and we have since found it very helpful in the differential diagnosis of malingering, hysteria, vascular disease, neuritis, certain orthopedic problems and other conditions.

The patient, 44 years old, had been injured in 1933, by catching the right foot in a stamping machine. As a result of the pain he fell in a distorted position. Immediately following the accident there was marked swelling, induration, discoloration, and pain of the leg and foot. The diagnosis made at that time was a severe degree of laceration, tearing, and straining of the muscles and ligaments, and ruptured blood vessels of the foot, ankle and leg. After several months the signs slowly disappeared, but extreme tenderness remained, involving the entire foot up to the ankle. Satisfactory examination was impossible and it could not be determined whether adequate circulation was present or not. During the next five years the patient was seen by numerous physicians and his case reviewed by compensation officials. However, no decision was made as to whether his condition was based on an excellent example of malingering, an orthopedic

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condition, vascular disease, or neuritis of some type. He was referred to us to establish the differential diagnosis. On first examination no evidence of vascular disease elsewhere in the body could be noted. The appearance of the foot was normal. There was no evidence of pallor on elevation or rubor on dependency—two cardinal signs. Palpation was very unsatisfactory because of the constant wincing and withdrawal of the foot. But while the posterior tibial arteries were present bilaterally, the dorsali pedi could not be felt in either foot. Oscillometric readings showed, however, ¼ swing over the arch of the normal foot, whereas they could not be taken for the injured foot because of protestations on the part of the patient of extreme sensitivity. The temperature of both feet was low, the toes averaging 24-25°C. (76°F.). Roentgenograms were then taken for bony or arteriosclerotic changes of the legs and feet. They were absolutely normal, not even showing evidence of disuse atrophy. The following study was then carried out:

Case 1: The patient was prepared for general anesthesia. Control temperatures of the toes were taken and repeated. The toes of both feet averaged 24-25°C. (76°F.). Cyclopropane anesthesia was then begun. Immediately upon complete induction motion of the foot was found to be in no way limited. An oscillometer was slipped over the arch and although the vessel could not be palpated, the reading was ¼ swing. In the light of the same situation existing in the other foot we felt that the dorsali pedi were probably bilaterally aberrant in location. Surface temperature readings repeated at this time showed no change. Co_2 induction was now undertaken. The blood pressure, which was previously 120/80, now began to rise, reading a high of 180/100. Then it began to fall and dropped to 100/65. As the pressure reached its peak, vasodilatation began to take place, thus accounting for the fall. The temperature of the feet rose rapidly, reaching an average for the toes bilaterally of 30-31°C. (87°F.). The oscillometric reading for the injured foot reached ¾ and for the normal foot ½. The dorsali pedi vessels were still not located but it was felt that the response having reached a normal vasodilatating point, indicated absence of organic vascular insufficiency. The next phase of the experiment dealt with the question of malingering. The anesthesia was lightened slowly, constant tests being made for response to pain by pressure on the supraorbital nerve at its foramen. At the point where such pressure elicited a definite pain response but while the patient was still definitely unconscious, comparative pressures were made on the two feet. Pressure on the normal foot elicited no response. Pressure on the involved foot elicited a marked pain response with withdrawal and contortion of the body. This, in our opinion, definitely established the fact that the man was not a malingerer; that he had real pain and tenderness; and by elimination left us with the diagnosis of neuritis. While he was still semi-conscious and it was possible to examine the surface areas, we mapped out what appeared to be the distribution areas of the fifth lumbar and first sacral nerves as the involved zones. Roentgenograms were then taken of the corresponding section of the spine. The fifth lumbar vertebra was found to be displaced anteriorly with the sharpening of the articular borders. The question was whether this was due to the injury under consideration or to a previous one suffered by the patient. The time of onset of symptoms would be the determining factor. Orthopedic treatment and nerve block studies were suggested as therapy.

This case study is presented in detail to illustrate one type of technique for establishing a differential diagnosis between vascular disease, nerve disease, and malingering in an extremely difficult case.

Pathological Conditions

Pathological Conditions Produced in Normal Arteries, Veins, and Lymph Vessels by Injury or Other Industrial Hazards:

Cutting injuries often result in the partial or complete severing of one or more blood or lymph vessels. The immediate problem is that of hemorrhage. Once hemorrhage is stopped other factors become important, such as whether the channels can be reopened; whether the extremity will suffer as a result of circulatory impairment due to thrombosis; or complete occlusion of the arteries, veins, or lymph vessels. Arteriovenous anastomoses may occur, as in the following case.

Case 2: The patient, a metal worker, aged 46, was engaged in cutting sheet Allegheny metal with a pair of shears, when suddenly the metal coiled back, cutting the dorsum of the right forearm just above the wrist. Veins, tendons, nerves, and a few small arteries were sharply severed. The surgeon who immediately saw the patient sutured the nerves and tendons very satisfactorily with good results, but was not so fortunate with the blood vessels. When seen a year later the patient had a markedly enlarged hand, forearm and arm. There was extreme dilatation of all of the superficial veins of the entire extremity and the engorgement extended over the pectoralis area. The right arm and hand were slightly weaker than the left, although the patient was fundamentally right handed. When the hand was held below the heart level, however, it became practically useless because of the swelling. Arteriographic studies showed a network of arteriovenous anastomoses at the site of the former injury. Oxygen saturation studies confirmed this finding, e.g., the venous blood showed almost as much oxygen content as the arterial and much more oxygen than the venous blood from the left arm, since the communication was directly from the arteries instead of through the capillaries where the blood normally becomes de-oxygenated. The surface temperature of the right arm averaged 3°C. higher than corresponding areas on the left. Unfortunately there were so many anasto-

moses that surgery seemed inadvisable. Cardiac enlargement which so often results from this condition, may later force a radical procedure.

PENETRATING wounds caused by penetrating objects include bullet wounds and those produced by objects projected at high speed, such as pieces of steel in manufacturing plants as well as stab wounds of various types. Hemorrhage is, of course, the most important immediate problem, followed by stasis; and in certain cases, inflammatory secondary processes such as arteritis and phlebitis. Not infrequently an after-effect in a healed but weakened vessel wall is the development of an aneurysm. Arteriovenous anastomoses are especially apt to result when the penetrating object injures both arteries and veins in its passage, producing a sinus tract which remains patent. Many instances of this have been noted following buckshot wounds of the legs, when many buckshot penetrating wounds may result in several arteriovenous anastomoses.

CASE 3: One of the most interesting cases we have seen occurred in a child. While this child was running along a street a pair of scissors fell from the window sill of the third floor of an apartment house. The blades opened and one stabbed the popliteal space. This was withdrawn in spite of considerable temporary bleeding; the wound healed fairly promptly. Months later it was noted that the involved leg began to increase in size more rapidly than its mate. The veins became engorged, a swelling appeared in the popliteal space, a bruit was heard over that area, and the diagnosis was obvious. Surgical excision of the fistula and, if necessary, the adjoining segments of the popliteal artery and vein was advised. This radical procedure has often been performed without circulatory incompetence developing.

If arteriovenous anastomoses are not ligated the result is usually a steady increase in the size of the limb together with engorgement, especially of the veins, and a cumulative strain on the heart which, in cases with large anastomoses, almost inevitably results in heart failure. The explanation for this is that the fistulous tract offers much less resistance to blood flow than the capillary and glomus network, thus resulting in the short-circuiting of a large portion of the blood flowing through the involved artery directly to the vein and back to the heart. The larger the leak, the more grave the consequences. To maintain adequate capillary circulation under these conditions the systolic pressure must become elevated. Blood volume also apparently increases in some cases. This whole process sets up a vicious cycle. The heart, especially the left side, enlarges to take up the additional burden. The proximal portion of the involved artery enlarges and this increases the size of the fistulous tract, resulting in greater strain on the heart. Eventually heart failure takes place.

Chemical studies of oxygen will reveal that the blood in the veins on the normal side contains far less O_2 than in the affected side, since the latter largely escapes the de-oxygenating process which takes place in the capillary bed.

The venous pressure on the affected side is much higher than on the normal side. The surface temperature is definitely higher on the affected side.

The presence of an arteriovenous anastomosis is a great stimulant to the development of collateral circulation. For that reason it is usually possible to excise surgically the affected portion of the artery and vein without serious circulatory impairment. Horton and his co-workers have reported an instance of excision of portions of the femoral artery and vein with the fistulous tract. At another operation on the same leg the deep femoral artery and vein were found to have a communicating anastomosis. Portions of these vessels with the tract were removed. In spite of the loss of function of both femoral arteries and both femoral veins, this patient had no serious evidence of vascular impairment and did not develop intermittent claudication on walking considerable distances.

STRAINING or TEARING of the vascular tree may occur under a wide variety of circumstances. Among the commonest of these is being struck by some heavy object, such as an automobile, or falling while a leg may be caught in an awkward position and thus producing a sudden severe torsion on the extremity and the body as a whole. Such accidents usually result immediately in severe subcutaneous hemorrhage of the injured part. Free hemorrhage does not occur unless the skin is broken. The secondary results may include many possibilities including thrombosis of an artery or vein, the development of aneurysms, phlebitis, arteritis, edema on a venous or lymphatic basis, and occasionally an abscess in a liquifying clot. Arteriovenous anastomoses may occur but are not common in this type of injury.

CASE 4: A man, 56 years old, was struck behind the knees by the bumper of an automobile. There was considerable strain and bruising at the time but apparently no serious injury. A year or two later a mass appeared very gradually behind the right knee. This steadily increased in size for several years, but the patient would not permit any treatment. Finally, about six years after the accident, a sudden pain occurred in the foot. It became very cyanotic and the tips of three toes became gangrenous. The patient suffered from extreme pain and tenderness of the foot. The lower leg became swollen and it appeared as though amputation would be inevitable. The diagnosis of popliteal aneurysm was made and the patient was sent to our service.

At examination the above findings were noted, plus the fact that the mass was the size of a peach and pulsating. Arteriographic studies showed a false aneurysm to be present and it was believed that small clots had gone down to the arteries of the feet. The increased pressure of the swelling further complicated the picture. We have had

fairly good results with the surgery of popliteal aneurysms in our vascular clinic. Exploration verified the diagnosis. The tibial nerve was stretched tightly over the bulging mass which turned out to be a firm clot walled in by the popliteal structures. The entire posterior wall of the popliteal artery was eroded away for a distance of over an inch. A Matas obliterative procedure was done. The patient never had pain in his foot after the operation. He was kept on a Sander's oscillating bed and the foot was put under a thermostatically controlled cradle at a temperature of 96°F. He made an uneventful recovery, losing only the tip of the fifth toe. In going over the patient it was noted that there was a small aneurysm of the other popliteal artery, but it was decided to do nothing with this at that time. Arteriosclerosis may have played a part in the development of these aneurysms, but the injury appeared to have been the precipitating cause. The Wassermann and confirmatory blood tests were negative.

Case 5: This case illustrates another type of result. A man aged 32 years, was lifting a heavy box which slipped and fell back against his legs, producing a severe strain on the muscles and soft tissues. Following the clearing away of the bruise a phlebitis of the left saphenous vein developed. This spread down the branches and up to the femoral vein. Veins of the trunk were involved. Two pulmonary and one renal emboli occurred, but after 18 months the process quieted down and recovery took place. The after-effects are venous edema and a tendency to varicosities of the saphenous tree. Many similar cases have been seen following such accidents as sprained ankles, twisted knees, etc.

Mention of a curious syndrome, primary axillary vein thrombosis, should be made since it involved straining but of a repeated mild sort. Most of the examples of this condition occur in young males in good physical condition who in their occupations repeatedly perform some motion involving the shoulders and arms to a moderate degree. Examples have been reported in garage workers, planers, etc. The following case is a good example.

Case 6: A young man, aged 32, working in a printing establishment was obliged to lift large sheets of paper (40-80 pounds at a time) and carry them to another pile. He was working on a night shift when one of his co-workers asked: "What is wrong with your right shoulder? It's bigger than your left one." The patient then examined it and realized that it was larger and stiff. The next day this swelling was greater, marked pain was noted, and there was a large thrombotic mass in the axillary vein. The superficial veins immediately became dilated in compensation and they steadily increased in size. Months of rest resulted in a slow canalization of the thrombus but four years later there was still stiffness, weakness, and marked compensatory dilatation of the collateral veins of the arms, shoulder, and chest. The patient was still incapacitated from physical work.

While some of these patient apparently make fairly complete recoveries, it is characteristic of this condition that return to even light labor usually produces a recurrence of the syndrome. Examples of thrombophlebitis are given in the following pages.

PRESSURE: When pressure is severe enough and persistent enough it can produce stasis followed by thrombosis of arterial, venous, or lymphatic vessels. This may be followed by phlebitis in some instances. This will be discussed later.

Case 8: This case illustrates the result of pressure on an artery. A boy, 15 years of age, suffered simple fractures of tibia and fibula just above the ankle. A cast was applied with good alignment. The next day the physician noted that the foot appeared discolored and removed the cast. The dorsalis pedis artery could not be palpated at first and the foot felt cold; but after a while the color and warmth returned and the pulsation could be felt. The cast was then reapplied and the patient allowed to go home. The next day the patient was suffering from severe pain and was admitted to the hospital. The cast was removed and the leg was found to be markedly discolored, cold, and no pulsation could be felt above the popliteal artery. This was verified by oscillometric readings when the patient was seen the following day. Blebs were forming and his temperature rose to 103.5°F. He was very septic and high amputation appeared to be the only recourse to save his life, since all of the usual vasodilators had failed. Pathological studies showed no definite thrombosis of the artery, the damage having apparently been done by pressure of the cast in the popliteal artery and its collaterals in the popliteal space. Necrosis of the soft tissues was evident throughout the leg. The patient's life was saved but at a high cost. I have known of several such cases.

Crushing blows involving heavy objects, can produce syndromes similar to those seen in injuries involving straining or tearing of the flesh. Subcutaneous hemorrhage, thrombosis, aneurysms, phlebitis, arteritis, and edema may be late after effects. This type of injury often involves deep vessels of the abdomen. Frequently, following a fracture of the skull, arteriovenous anastomoses occur involving vessels of the base of the brain. Cardinal signs are the development of a unilateral exophthalmus together with a bruit heard over an area or the whole skull. The patient hears this magnified many fold.

We have seen five such cases, three of which had not been diagnosed even years after the original accident.

PERCUSSION of the finger tips or hands frequently repeated under certain conditions to be described, may apparently produce a definite vascular syndrome, similar in certain respects to an early, pregangrenous Raynaud's syndrome.

Because this syndrome was especially studied in individuals who used pneumatic hammers or drills, it became commonly known as 'pneumatic hammer disease.' As will be demonstrated the same syndrome may occur from other activities involving percussion, such as typing, piano playing, telephone switchboard operation, etc., and it would be better to identify it with some such term as traumatic vasopastic syndrome.

It appears that two factors enter into the production of this syndrome in an individual with apparently normal vessels. First, the individual's fingers or hands must be exposed to repeated percussive trauma over a period of several years. Second, the individual must have a neurocirculatory make-up which renders him susceptible, since many individuals exposed to the same trauma do not develop the syndrome. The trauma previously described has been due to the use of pneumatic hammers and similar tools, and shoemakers' pounding and lasting machines—all with high vibration rates (2,000-4,000 strokes per minute). The history, symptoms, and physical signs are essentially similar whatever the etiology.

The syndrome develops as follows: the first symptoms are numbness, and neuritis-like pains in the affected finger. These symptoms may come on during rest or work, cold aggravates them, and heat decreases the tendency. In the cases due to pneumatic tools the finger nearest to the end of the instrument where the maximum vibration occurs is usually affected first. The tendency to develop the syndrome is less marked where the machines are warm. Anesthesia or slight pain in the affected area is common during attacks and stiffness may be marked enough to interfere with simple motions, such as buttoning clothes. When warmth is applied to the fingers recovery is quick and is frequently accompanied by a tingling, prickling, or burning sensation. Body temperature is an important factor since in advanced cases chilling of the body may precipitate an attack. When the body is warm it is difficult to produce an attack. The early morning is frequently the most annoying time, possibly because the body temperature tends to be lower at that time than during the rest of the day. Emotion does not commonly appear to produce attacks. Physical signs during an attack are in many ways similar to Raynaud's syndrome in the pregangrenous stage. Between attacks the hands appear normal in all respects. When an attack begins as a result of cold or percussion, or both, the finger, fingers, or hand become cyanotic, usually slate blue to purplish. This starts from the tips of the fingers and proceeds later up to the hand. If the attack persists a secondary waxy pallor replaces the cyanosis. The blueness or pallor persists until the hands or body are warmed, after which irregular red blotches begin to appear as groups of arterioles release their spasm. These gradually coalesce until the stage of pronounced erythema is reached. This is maintained for from one-half to one hour after which the bright color fades away, leaving the skin its natural color. During the attacks the surface temperature of the affected parts is often very low –2° –4° C. below normal room temperature. When the stage of erythema sets in the surface temperature rapidly rises to 30-31° C. (87° F) and then slowly drops back to the patient's average normal temperature.

Neither sweating nor swelling of the hands or fingers occurs during the attacks; the veins are small and the radial and ulnar pulsations diminished. Arteriographic studies have shown actual spasm in the arteries during attacks. Bleeding does not occur if the area is cut during an attack, and at most a few drops of dark red blood ooze out. The nose, ears, cheeks, and feet are free from attacks, as differentiated from the typical Raynaud's syndrome. Small cyst-like areas of decalcification have frequently been noted in the bones of the hands which are thought by some to be part of the syndrome, but this point needs further investigation.

Rest from the regular occupation results in improvement only if the condition is early and mild, otherwise exposure to cold will precipitate further attacks. In mild cases the progress of the disease will be stopped; keeping the hands and body warm is essential to good treatment. Iontophoresis with mecholyl or histamine appears to be very valuable in the treatment of this condition. In severe cases ganglionectomy may be considered. The use of protective rubber pads might prevent some of these cases. Improvements in the structure of the vibrating machines may prove to be a solution.

Of especial interest is the fact that we have seen two instances of the identical syndrome in typists, one in a male concert pianist, one in a boxer, and one in a telephone switchboard operator. In each instance the condition became severe enough to interfere with the patient's occupation. The pianist was forced to give up a successful career for three years, since playing precipitated violent attacks whereas they were less severe when he did not play. These cases are dealt with in following pages, but they are mentioned here to emphasize the fact that this syndrome may be produced by other types of percussion than was previously believed. In all probability other etiological factors will shortly be reported.

EROSION OR CHEMICAL IRRITATION may appear in some instances to initiate vascular pathology by affecting a local area of a blood vessel. Inflammatory reactions frequently occur resulting in thrombosis which may extend with or without secondary infection playing a part. Several cases will be briefly described to illustrate the wide variety of causes which must of necessity be considered.

CASE 9: A young man, aged 32, worked as a laborer, and for some months he had been carrying bundles of chipped slate shingles. The chips were sharp and repeatedly wore down the skin of the tips of the fingers, producing ulceration. He appeared at the clinic with a very angry infected

ercsion of the tip of the right fifth finger. He was a heavy smoker. The process appeared similar to thrombo-angiitis obliterans. Arteriographic studies verified the presence of a process resembling this condition with peripheral obliteration beginning with the smaller arterial radicals and extending centrally to involve the palmar arch. In this instance it is probable that the erosion was an aggravating factor superimposed on an early or latent case of thrombo-angiitis obliterans, but the possibility that the process was initiated by this irritation cannot be denied in the light of our present limited knowledge of this subject.

Case 10: A man, aged 55, had for many years been engaged as a copier of music. This necessitated the use of a black ink; pressure incidental to grasping the pen on certain areas of the fingers; and three or four times a day use of ink eradicator on the same areas to remove the ink stains. Gradually ulcerations began to develop at exactly the areas involved by pressure, ink, and ink eradicator, namely, the tips of the first and second fingers and the approximating surface of the third finger at the level of the distal phalangeal joint. Evidences of thromboses became manifest. These thromboses involved the palmar arch; then the radial artery and in spite of vasodilators, including typhoid vaccine, abstinence from tobacco, and other therapy, the thrombus, now easily palpable, steadily ascended the arm into the brachial artery. When it reached a point about three inches below the axilla it was felt that a radical procedure was warranted. The entire process had taken about three months to that point. Dr. Robert Ackerly operated, removed a segment of the brachial artery, and ligated it distally. A clot about six inches long extending over into the axillary artery was loosened and removed; the artery ligated proximally and the patient recovered satisfactorily. Six months later there had been no extension of the process and the arm functioned fairly well. Sections of the artery showed changes about which pathologists were hesitant to commit themselves. The process appeared similar to thrombo-angiitis obliterans. Clinically, as above outlined, the onset and history were not typical. Again, in this instance, we cannot be certain that the condition started with a normal vascular tree but the irritation factors either precipitated or aggravated the active pathological process.

Case 11: A case of a different sort should be briefly mentioned as having a possible legal if not industrial significance. A well-trained physician was giving an injection of salygran intravenously in the right cubital vein. Suddenly the patient cried out with pain, which extended from the shoulder to the hand. The hand quickly blanched to a dead white and the radial pulse was absent. Morphine sulphate was given and the arm warmed. Forty-five minutes later the radial pulse was palpable but in another hour it disappeared again. When seen in consultation about eight hours after the accident the hand was clenched, dead white, and cold. The forearm was swollen with a patchy greyish cyanotic pallor and the swelling extended above the elbow. The brachial artery did not appear to pulsate distally below a point from four to five inches below the axilla. It was palpable as a cord-like mass down to the cubital space. Amputation later became necessary despite all efforts to insure vasodilatation. The mechanism involved would appear to be based on the probability that some of the salyrgan leaked out into the surrounding tissues, if not into the wall of the artery itself. Secondary to this chemical irritation, the artery obviously went into acute spasm which was released temporarily at one time and then recurred, this time with thrombosis and permanent closure.

POISONING: Lead, manganese, and certain other metals are capable of producing vascular changes. Of these, lead is alleged to constitute the major industrial hazard. *This is open to some question at present.* The vascular changes appear to depend on long continued exposures and to be in the form of an early development of sclerotic-like changes in the arteries and even the veins. Patients in their thirties have been seen in whom the entire major vessel trees of both legs, arterial and venous, could be seen clearly on ordinary flat x-ray plates. We have considered that the usual occupations producing this type of condition are painting, plumbing, and printing. The symptoms of lead poisoning are evident more commonly on a basis of polyneuritis, but when advanced enough the vascular changes produce the symptoms of ischemia, e.g., atrophy of the tissues, intermittent claudication and trophic changes. Frank gangrene is rarely if ever seen on this basis alone, but may occur in conjunction with other types of vascular impairment.

FREEZING: is a common factor in the production of vascular pathology in northern zones during the winter months. Extreme cold damages the vessel walls and produces thrombosis. The vessels usually involved are in the local areas actually frozen. Rarely is there extension to unexposed areas. It is very important to realize that *extremities with vascular impairment will suffer from frost-bite at higher temperatures and with shorter exposures than normals.* Gangrene varying from superficial to massive forms frequently results from freezing. The prognosis is usually good except for the areas involved.

MEDICOLEGAL PROBLEMS: A question of increasing importance and frequency of occurrence in medicolegal problems today is that of the relationship of aggravation of a latent peripheral vascular disease to the incapacitating injury following a known trauma. If the underlying vascular disease has been recognized prior to the accident the relationship may apparently be more direct. Even here difficulties arise requiring careful study and sound judgment. The more

serious enigmas are found in the group of patients who are discovered to have vascular disease after the accident occurred, sometimes in fact, a long time afterwards.

It is impossible at present to lay down a set of standards by which all such cases may be judged. An attempt will be made to clarify the picture somewhat by citing illustrative conditions and case problems which have arisen, associated with numerous vascular diseases.

ARTERIOSCLEROSIS OBLITERANS (SENESCENT, DIABETIC, LEAD): Arteriosclerosis obliterans, as is well known, does not appear suddenly but, whatever the basis, gradually involves the walls of the arteries and arterioles over a period of many years. Unfortunately most physicians do not include even a simple palpatory examination of the arteries of both pairs of extremities in their physical examinations so that occlusion of, for instance, the dorsalis pedis artery may be present for years without recognition. The major arteries may, in fact, occasionally be occluded up to the knee without producing symptoms calling attention to the situation. In other individuals the pains in the legs are passed off as 'arthritis' or 'rheumatism' without adequate examination. This situation may exist until some trauma occurs. The injury may be massive, including a fracture or severe wound or it may be very slight, such as the paring of a callus too closely or the stubbing of a toe. After awhile the patient and the physician realize that the wound is not healing properly and the discovery is made that the reason for this is an underlying fault in the circulation to the part.

Even from the smaller lesions more serious trouble frequently arises, such as: (a) non-healing ulceration; (b) local gangrene; (c) secondary infection; (d) massive gangrene; (e) amputation; (f) sepsis and death. The process may stop at any of the above points and begin healing, but occasionally its course is irreversible. It is vital, therefore, with all lesions and whatever their nature may be, to determine the circulatory status of the affected part, so that, if indicated, proper steps may be taken to produce improvement.

From an industrial angle the question raised in these cases is that of cause and effect. Which is responsible for the ultimate unfortunate result, the accident or the arteriosclerosis obliterans; The probability of healing is enormously reduced by the presence of the degenerative occlusive disease, but on the other hand, such a condition may exist for years without serious complications unless an injury ignites the tinder with a spark. Where no healing takes place and the lesion continues actively from the day of the accident, it seems unquestionable that the injury must be regarded as incapacitating aggravating factor, and is therefore compensable in most states and countries. The situation becomes much more complex when the initial wound heals, or even when there is no initial wound, and a long time later a lesion appears in essentially the same location with resulting incapacity. The question then arises: did the original injury produce sufficient damage or start up a low-grade process responsible, together with the circulatory impairment, for the present condition? The decision must rest on numerous factors, among the most important being evidence of discomfort, pain, redness, swelling, or other signs and symptoms during the intervening period; and secondly the length of time of that period. On the basis of considerable experience and study of this problem I believe that a period of as long as two or three months is admissable, and longer if intermittent or continuous symptoms are present. With no evidence of trouble for more than three months it is doubtful whether a definite causal relationship should be accepted.

The above discussion applies for almost all types of injuries whether crushing, cutting, straining, freezing, or any other. As noted above, freezing may occur at a much higher temperature level in individuals with a decreased arterial blood supply than with a normal circulation. This should be considered when older persons are employed for out-of-door winter work or work in refrigerating plants.

When arteriosclerosis obliterans is discovered as a result of routine examination or injury, conservative measures should be undertaken, such as, contrast or sitz baths, abstinence from tobacco, special care and cleansing of the extremities, Buerger's exercises, and in more advanced cases, thermostatically controlled heat cradles, pressure suction boots, oscillating beds, and injections of pancreatic tissue extract. Surgery should only be undertaken after the most mature consideration. Minor surgery at the original site of the lesion is often better classified 'meddlesome' than helpful. It is usually much better to allow self-amputation to take place whenever possible, merely aiding this by severing tendons, etc., since the poor blood supply prevents healing if much cutting is done. If amputation becomes necessary, the level should be at a point where adequate circulation is present. This can best be determined by the oscillometer and, if necessary, arteriographic studies.

THROMBO-ANGIITIS OBLITERANS: Thrombo-angiitis obliterans may be present and even slowly progressive for a very long period of time without symptoms, signs or recognition. This has been demonstrated by vascular examinations including arteriography in extremities previously assumed to be free from any vascular disease. Trauma, however slight, frequently initiates a process in such a foot or hand which progresses to a non-healing ulcer and local or massive gangrene. The injury is often so slight that it would normally heal quickly, instead of becoming an excruciatingly painful ulcer. Is the injury or the thrombo-angitis obliterans responsible for the ultimate condition? It must be conceded that in those instances where the wound progresses from the time of the accident, it constitutes, at least, an

aggravating factor and as such is usually compensable.

When the wound apparently heals only to break down later or does not show evidence of a serious condition for weeks or months after the accident, the problem resembles that presented in similar situations in patients with arteriosclerosis obliterans. We do not usually consider the existence of a definite relationship if no symptoms or signs whatever are present for an interval of three months or more between the time of the accident and the time of the onset of symptoms. A shorter period may be debatable, since in this disease a very low-grade process may be active for a considerable time without producing sufficiently marked discomfort to focus the patient's attention on the involved area. This facet of the problem is further complicated in thrombo-angiitis obliterans by the fact that the majority of the susceptible age group (20 to 50 years) smoke and the use of tobacco per se may aggravate, or as some investigators feel, initiate the disease. A case history might be in point in this relation.

Case 12: A young Hebrew male, aged 27, worked as a day laborer handling rough materials. Gangrene developed at the tip of the fifth right finger. Arteriograms showed involvement of the peripheral arteries typical of thrombo-angiitis obliterans — the third right finger being the next most seriously involved. Rest, abstinence from tobacco, and intravenous typhoid vaccine injections produced healing of the lesion. The patient was warned to protect the third and fifth fingers and not to smoke. He went back to his work after several months. In the sixth month he smoked three cigarettes in one day. That night the third right finger became extremely tender and a fulminating gangrene set in which resulted ultimately in the loss of the digit.

A slight trauma or frost-bite might easily have produced the same picture, and if coincidental with the onset of smoking would greatly complicate the possibility of making a satisfactory decision regarding cause, aggravation and effect.

Commonly the vascular disease is not discovered until after the accident has occurred and the wound fails to heal, as in the patient who had a small hand truck run over his first right toe, or the patient who, working as a telephone lineman, froze the toes of his left foot. Among the most interesting groups from the medicolegal aspect is that from which the following case abstract is presented.

Case 13: A young male, aged 29, developed what appeared to be a simple paronychial infection around the left first toe. A surgeon decided to produce adequate surgical drainage and as a prelude did a novocaine block around the base of the toe, using novocaine and adrenalin solution. Following the injection the entire toe promptly turned dead white and never regained its normal color. The next day it was jet black and mummification set in. After the anesthesia and not until then, the surgeon palpated for the dorsalis pedis artery and found it occluded. The toe finally separated and the lesion healed. The patient was suffering from thrombo-angiitis obliterans, which was undoubtedly present before the operation. With the deep vessels occluded, the injection of adrenalin probably reduced the potential circulation to a level compatible with the life of the tissues.

The lesson is obvious. No surgery should be undertaken on the extremities without determining the status of the peripheral circulation.

Raynaud's Syndrome: The production of a Raynaud's-like syndrome as a result of a percussive trauma such as the use of pneumatic hammer, typewriter, piano, etc., has been described under the heading *Percussion*.

This section is to be devoted to the problems which arise as the result of industrial hazards in individuals who already are suffering from the Raynaud's syndrome. This disease develops on the basis of vasospasm of the arteries' arterioles secondary to overactive sympathetic nerve impulses. During the pale phase the capillaries show practically no blood and the skin temperature is very low (70° –72° F. — 21° –22.3° C., or lower). Curring the skin elicits essentially no bleeding. During the erythematous phase the capillaries engorged with rapidly flowing blood and the surface temperature is high (91° –94° F. — 32.8° –33.8° C.). Since organic vascular changes are not usually present except in advanced disease, direct injuries such as crushing blows or lacerations rarely produce any more severe complications than are seen in normal patients. The factors of exposure to extreme cold or moderately cold dampness which are inherent in certain occupations, become very important in patients with Raynaud's syndrome. The syndrome is at least twice as common in women as in men. It is probable that it is not caused by cold alone, but the severity of its course seems to bear the same relationship to the frequency and severity of the spastic attacks. It is much easier for frost-bite to occur in these nearly bloodless tissues once spasm has taken place. Individuals suffering with this syndrome should, if possible, certainly avoid out-of-door or any other type of work at low temperatures. Examples might be mentioned as follows: laboring work, telephone line work, refrigeration, driving an unprotected automobile or truck, etc.

Nervous tension, worry, or anger may increase the number and severity of these attacks and may, of course, be associated with any occupation, but will probably not be responsible for any serious compensable condition.

Prevention of this syndrome may usually be achieved in a fairly satisfactory manner by protection from cold and undue worry. Warm clothing should be worn, especially over the affected extremities. Treatment includes mecholyl by mouth and iontophoresis and in severe cases ganglionectomy.

SYPHLITIC ARTERITIS AND PHLEBITIS: In our experience these conditions are not as common as some workers imply. The mere finding of a positive Wassermann test in a patient with some pheripheral vascular disease is not sufficient to warrant the diagnosis of syphilitic vascular disease, since a purely coincidental occurrence is more common than are the pathological findings of syphilitic changes in the vessels. Occasionally the differential diagnosis becomes important following trauma, as in the following case.

CASE 14: A man in his early forties was referred for study by the New York State Labor Department. He gave a history that about six weeks before during a very cold spell and while driving a bus, his foot suddenly slipped off the clutch which struck his shin. He rested for about a week and then returned to work against his physician's advice. Seventeen days after the accident he suddenly felt a sharp pain in his left foot and calf. His foot became more painful and the following day several of the toes became gangrenous. He was hospitalized. Absence of the dorsalis pedis artery was noted and the diagnosis was made of trauma or frost-bite superimposed on arteriosclerosis obliterans. His treatment was conservative. Six weeks later when I saw him the gangrene was still present, although alleged to be improved. Careful observation before touching the patient revealed a very important point, hitherto unrecognized — namely, that his entire leg and foot moved markedly with each heart beat. Palpation of the popliteal space demonstrated a walnut-sized popliteal aneurysm, probably of a false type (ruptured). Further examination revealed a suspicous right popliteal aneurysm, possibly axillary aneurysms and evidence of an aortitis and aneurysm, which later x-ray examination confirmed. The logical explanation of the absent dorsalis pedis artery and gangrene was that a small portion of clot from the left popliteal aneurysm broke off and descended the artery to occlude it.

It is improbable that the episode with the clutch or the cold weather affected the course of the disease since such accidents frequently take place in the presence of popliteal aneurysm without any trauma. The etiology of this condition is undetermined, the age of the patient being under 50 and especially with evidence of other aneurysms being present. Roentgenograms of the extremities failed to reveal any evidence of arteriosclerosis. The blood and spinal fluid Wassermann tests were reported to be negative. About a year later I again saw this patient who had developed a much larger left popliteal aneurysm with resultant contraction of the leg at the knee. An attempt was made to save the leg by aneurysmal surgery plus the use of heparin, but without success a mid-thigh amputation being necessary to save his life. All other aneurysms had also increased in size. This case report merely emphasizes the necessity for maintaining an alertness for underlying deep-seated pathology which may be the real basis for the condition under consideration. Such is often temporarily overlooked because of interest in the apparently obvious effects of trauma.

POLYCYTHEMIA VERA: is occasionally wrongly diagnosed as thrombo-angiitis obliterans because of the thrombotic occlusion of some of the smaller arteries with resultant gangrene. We have seen several such instances. The correct diagnosis is usually easily made by means of a blood count and especially if there is an enlarged spleen (not always present). In the presence of the tendency toward thrombosis, trauma may precipitate extensive thrombosis with occlusion and even gangrene which would not occur under equivalent circumstances with a normal blood picture.

CERVICAL RIB-SCALENUS ANTICUS SYNDROME: Cervical ribs are frequently present for many years without symptoms and may be discovered quite accidentally in roentgenograms taken for some other purpose. A sudden or gradual strain may precipitate symptoms due to either stress on the brachial nerve plexus or the subclavian artery. The arm may become pale, even pulseless, and the discomfort acute. Relief may be received only by removal of the cervical rib.

Within the past few years it has been realized that a large proportion of the so-called 'cervical rib syndromes' were actually due to pressure of the scalenus anticus muscle on the brachial plexus or subclavian artery. Cutting the muscle, a much simpler procedure than removal of the rib, results in relief and, if the vessel has not thrombosed, restoration to normal circulation results.

CASE 15: A young man, aged 36, was recently admitted to our service with the following story. He had been a painter for many years without symptoms but a few days previously had slipped on a ladder and caught himself by his right arm. It was during a cold spell. His arm and hand became cold, pale, and moderately uncomfortable but retained their normal strength and he kept on working for several days. The discomfort became more marked and he came to the Post-Graduate Hospital. No pulsations were palpable or determined by oscillometric readings below the axilla on the right side, whereas they were normal on the left. Roentgenograms were negative for cervical rib but suspicious for a cartilaginous band which frequently takes its place and is often unrecognized. A diagnosis of scalenus anticus syndrome or cartilaginous rib pressure was made. Operation by Dr. Gerald Pratt revealed the former and the muscle was cut. The arm rapidly became warmed and collateral circulation rapidly improved. The brachial artery was thrombosed and had not canalized at the last examination three weeks postoperatively. The prognosis for saving this arm was, however, good.

THROMBOPHLEBITIS is frequently both initiated and aggravated by injury, sometimes of an apparently insignificant nature. Why

this is so is often very difficult to determine. One theory holds that the trauma starts up a reaction in the vein wall producing a thrombus. Following this, bacteria drifting in the blood stream become engaged in the clot and grow as in a culture, producing an inflammatory reaction. In migratory thrombophlebitis bits of clot or bacterial groups break off, locating elsewhere in the body. The reason why this does not occur in arterial injury lies in the direction of the blood flow—in the arteries peripherally and in the veins centrally, where it can result in a wide distribution. If this theory should be correct certain factors are worthy of further study, e.g., the clots or bacterial clumps must be minute and their affinity specific for venous walls, since the disease does not affect the arteries but must pass through the capillaries or glomi to settle on the venous side of the vascular tree. The cultural findings in these cases are extremely inconsistent and inconclusive, with no specific organism being proved responsible thus far. This has given rise to theories of an allergic or virus basis but as yet these have not been substantiated. Mildness of the primary cause may be illustrated by the following case.

Case 16: A nurse, aged 23, struck the calf of her leg against a crank handle of a gatch bed. A small bruise appeared which she ignored for several days. It persisted, however, and presented evidence of a local venous thrombosis with redness, heat, and a cord-like swelling. She was put to bed with cold packs but in spite of months of rest this process continued locally. It also began a migratory course which has involved most of the systems of veins in the body, including both arms and legs, the mesenteric, veins of the abdominal wall, and there has been evidence of involvement of the coronary veins and possibly the cerebral veins.

Four cases of migratory phlebitis have been seen originating in the veins over the dorsum of the foot, probably as a result of too tight lacing of the shoe laces. These are instances illustrating the effects of slight trauma. Patients suffering with local or migratory phlebitis as a result of more severe trauma are constantly being seen. Even the local involvement is potentially serious due to the possibility of embolism to the lungs and elsewhere, or the development of a migratory syndrome.

Once a patient has had thrombophlebitis the involved venous structure becomes susceptible and slight twists, strains, or blows appear to be capable of bringing about a recurrence even years later. Infections and unknown factors may also produce this effect so that in the event of a workmen's compensation claim this aspect must be carefully weighed against the alleged history of the precipitating injury. The course of the local disease is characterized by the following: (1) swelling, frequently cord-like along the course of the vein; (2) local heat; (3) redness, if a superficial vein is involved; (4) fever which may or may not be present; (5) edema around and distal to the site of involvement; (6) the white blood count and sedimentation rate are frequently but not always increased.

In severe, prolonged cases there may be evidence of generalized toxicity, e.g., high fever, severe general malaise, loss of weight, anemia, and weakness.

This syndrome may be prolonged for from 10 days to several years. Sequels frequently include edema of the ankles, marked discoloration about the ankle due to excessive dilatation of the minute vessels, and varicose veins due not so much to an attempt at compensation, as is generally thought, as to destruction of the valves by the disease. After prolonged edema of the tissues for years ulcerations easily form about the ankles, *especially following trauma.* Because of poor tissue resistance these ulcers become chronic and indurated. We have seen them in individuals in whom they have been present as long as 35 and 37 years.

The preferred treatment for acute phlebitis is, in our opinion, complete rest in bed until 10 to 14 days after the symptoms have subsided. In our hands cold packs at alternating hours have been most helpful. Some workers prefer heat but we have only seen further inflammation and continuance of the process following the application of heat. The technique of bandaging the leg tightly and forcing the patient to walk is, in our opinion, extremely radical and dangerous. We have been repeatedly called in consultation to handle serious complications precipitated by this procedure. When patients get up they should wear elastic stockings made to fit them, for six to 18 months or more. For the edema and vague, continuing aches and pains and ulcers mecholyl iontophoresis is very helpful, as it stimulates local circulation moving along the stagnant material. Unna's paste boots are next in value. Cod liver oil ointments have been used with encouraging results. Other ointments and dressings seem largely palliative. When varicosities develop, local or saphenous vein closure may be considered by the elected technique of injection and ligation.

Where varicose veins are already present the danger of lighting up a phlebitic process is markedly increased. In certain instances where the vein wall is thin and superficial, it is possible to produce a rupture of the vein by trauma.

Case 17: A man, aged 43, was standing at the top of a flight of stairs leaning against a railing. In some way he lost his balance and in saving himself threw one leg over the railing and slid down the flight of stairs. This leg had marked varicosities of long standing, involving the whole saphenous tree. There was marked bruising, and many moderate hematomas were seen throughout the whole length of the medial aspect of the leg. Above the ankle a vein was severely ruptured under the skin and a fluctuating hematoma the size of a plum resulted. A very severe edema of the lower leg and ankle occurred. At first it was proposed that the hematoma should be incised

but with rest and conservative therapy the entire effects of the accident subsided within two months. Curiously, no phlebitis was produced. Ligation and retrograde injection of the saphenous vein and its branches were recommended for a later date. This procedure would not, of course, fall under workmen's compensation insurance, although the immediate disability would, if it occurred in industry. If a phlebitis had occurred directly following the injury and produced incapacity, it would in all probability have been subject to workmen's compensation.

PRIMARY AXILLARY VEIN THROMBOSIS: No better example of the effects of industrial hazards on primary axillary vein thrombosis could be quoted than the subsequent history of *Case 6* mentioned earlier under the heading *"Straining or Tearing Injuries."*

LYMPHANGITIS, LYMPHEDEMA: Not infrequently following injury with secondary infection the red streaks of lymphangitis are seen extending up the arm or leg, as the case may be. The lymph nodes act as the lines of defense and usually with subsidence of the infection, the red streaks fade, become brownish, and gradually disappear leaving no noticeable sequelae. Occasionally, however, as a result of this type of syndrome, blockage of the return lymphatic flow occurs, whether in the channels or more commonly in the glands. This may result in the premanent development of lymphedema. Lymphedema may also develop as a result of congenital or familial syndromes such as Milroy's disease, and occasionally with no known etiological background. Injury to this waterlogged, swollen tissue may result in ulcers of marked chronicity which heal with great difficulity, if at all. Mecholyl iontophoresis is helpful for healing the ulcers, but does not seem to affect this type of edema in contrast to its effects on venous edema. The only treatment of value to extreme cases is surgical, a modified Kondoleon's operation being the technique of choice.

Summary

THE possible complications which may arise as a result of the various hazards of industrial life, and their direct and indirect effects on the peripheral blood and lymph vessels, are so numerous as to defy description in so brief a paper. An attempt has been made to enumerate the problems commonly met with and to suggest methods of approach which will result in logical and correct diagnosis. Some of this material is presented for the first time in print and all of the illustrative case histories are from the personal experience of the author. While many aspects of industrial medicine are of recent development, the study of the peripheral vascular complications may claim to be one of the youngest branches. For this reason it is to be expected that certain of the ideas expressed in this paper as apparently factual will prove, in the light of later discovery, to be half-truths or errors. Pending such findings, it is believed that the information herein contained will serve as a helpful guide in this new field.

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Discussion:

DR. GILBERT MARQUARDT (Chicago): DR. WRIGHT has covered this subject in a rather masterful fashion and leaves us with two or three vague ideas as to what to do about the prevention of some of the traumatic injuries and their subsequent arterial damage.

The accidents speak for themselves. The cure there, of course, is prevention. In a prophylactic way, how-

ever, as we see these industrial conditions arising secondary to minor trauma, which we feel sure would not have been provocative in the face of an adequate prevention, our starting point should be thorough and adequate study of the vascular system as a functioning organ in any individual who is liable to any type of traumatic accident.

Simple inspection and palpation of the arteries still has a most valuable place in this prophylactic program. Note possible color changes, rubor on dependency, pallor on elevation. Pay some attention to these very frequent infections of the skin. These types that belong in the ringworm group and occur so frequently, in connection with the thickening of the nails and absence of hair on the dorsum of the toes, are often evidences just shouting of peripheral vascular insufficiency.

The anomalies of the positions of the vessels which occur in 4 or 5% of the cases can be picked up easily on examination, and, by the thorough methods outlined by DR. WRIGHT, would not preclude the employment or the useful occupation of many individuals.

One other point which industrial men, particularly surgeons, should be familiar with is the atrophy of disuse which occurs in connection with muscles, tendons, and bones. Recently we have measured by objective methods the circulatory efficiency of arms that had been injured just before they were immobilized for one reason or other, fractures and sprains. We measured them again three or four weeks later and found a decrease of 30 or 40% in the arterial output of an arm put at rest for a period in excess of two weeks.

This is a very important point, because we recently saw a case in which a fireman had had a fracture of the femur. He suffered some shortening; claimed inability to move; lost function of the leg. His clever lawyer consulted a vascular man, who admitted there was some decrease in the vascular circulation. The lawyer didn't allow him to add that this would have compensated if the man had been allowed to use his leg — which it would have done — but left it at that. This man collected an excessively high verdict on the basis of this insufficiency alone.

General metabolic disturbances which may affect vascular disease, of course, are becoming very numerous. The numerous deficiencies of vitamins, particularly the B complex, in association with peripheral neuritic pains and the edemas are the main groups that we must watch for.

These occur particularly in single men in the lower wage brackets who lack fresh vegetables and fruit in the wintertime; and in the single men because they are more apt to eat out of cans and not get a balanced diet. Diabetes, arteriosclerosis, and syphilis, of course, still remain as important factors.

The posture habits of these individuals are worth considering, whether they are sitting or standing. We do see a good many localized blood vessel lesions produced at the site of trauma, as DR. WRIGHT pointed out. It may be repeated and any modification should be carefully watched as a source of industrial hazards.

The concomitant injuries, such as acute bursitis, calcification of muscles from any cause whatever, embolic phenomena occurring in the minor vessels may very often have a reflect spasm and cut down the general arterial flow in that particular segment and stimulate a serious difficulty.

Certainly DR. WRIGHT has very well and very thoroughly covered all of the traumatic type of lesions. Fortunately, nature is with us in most of these and if we are very careful to support the arteries and prevent further discomfort, there is one point which helps us tremendously in evaluating the prognosis of them, and that is that the collaterals form in direct proportion to the amount of time required in the occlusion. If it is a slow, gradual occlusion, plenty of time is allowed for the development of collaterals, and we usually find them. With the traumatic ones, which are sudden, the morbidity and mortality of the area of the organs affected is greatly increased.

Lead Poisoning

—*From Unusual Causes*—

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LIKE the poor, lead poisoning is always with us. Obviously this has been true since man first discovered the manifold uses of this metal, and indeed the connection between the use of lead and the symptoms it produces was known even to the ancients.[53,86,124a] Today the ordinary lead hazards are well known, particularly those encountered in industry, but a careful perusal of the literature reveals unrecognized hazards in unexpected places and under unusual forms. Early in the nineteenth century unusual sources of lead poisoning were listed by Tanquerel des Planches;[124b] lead hazards to children were tabulated at the turn of the century; [34,89a,133] during the same era cases of unusual etiology in adults were collected, [60,70,88] and more recent lists have also been compiled.[73,110,128] Most of the practices mentioned in the older articles have been corrected but some still persist and new, often bizarre, causes of lead poisoning have appeared.

Lead in alcoholic beverages has probably caused poisoning from time immemorial. Hofmann[53] searched the classics for records of poisoning from this source. He found various recipes for preparing the must — called "sapa" and "defrutum" — which was boiled down and added to other wines to improve their flavor and perhaps to preserve them, and in every instance a leaden kettle was recommended for this purpose. Although the Greeks and Romans knew the toxicity of lead they evidently did not realize the hazard of using leaden vessels for cooking and wine-making and when illness resulted from drinking wine it was attributed to other causes such as marble, pitch, salt, etc.

The names "Devonshire colic" and "Poitou colic" are but two of many synonyms for lead colic that have come down to us from former days, reminiscent of a time when epidemics due to the consumption of lead-containing wine, beer, etc., were of more or less common occurrence. Tanquerel des Planches[124c] has written an illuminating account: "Writers in the eighteenth century mention a great many cases of lead colic, epidemic in its forms, produced by the use of wines adulterated with litharge, or white lead, for the purpose of rendering sweet and agreeable, those that were sharp and harsh. This fraud was then generally practiced and occasioned so many diseases, in Germany, Italy, and France, that the governments of those countries were obliged to publish several ordinances, in which they declared that the greatest severity would be used against persons who permitted such deceptions. Zeller relates, that a publican was condemned to death, because he had caused an epidemic lead colic in a village in Germany, by sweetening his wines with litharge. This unfortunate person was himself attacked with

this disease." Stiefler,[119] who has also written a very interesting review of the literature on this subject, mentions an ordinance issued by Kaiser Friedrich in 1487 as one of the earliest of which we possess a record.

In a survey of present-day conditions in country districts of Upper Austria, Stiefler found that poisoning is still caused rather frequently by the use of lead pipes, etc., in wine-making and by other careless practices such as the repairing of cooking utensils with lead. This report has been confirmed by both Duy[35] and Nedok.[92] Willcox[141] observed lead poisoning in country districts of England where home-made wine is fermented in a "red glazed pan," glazed with a lead compound readily soluble in fruit acids; and Jackson[59] reported in 1932 on "a local outbreak of Devonshire colic" from cider drawn from the casks through lead pipes. Ten years earlier a similar epidemic in the county of Middlesex was traced to beer kept in newly installed lead-glazed tanks.[62] Lead poisoning from this source seems to have appeared in the United States coincidentally with the eighteenth amendment. Several case-reports of poisoning from "moonshine" whiskey and home-made wine and beer appeared in the literature[2,69,134] and doubtless many others failed to be recorded. Moore[91] describes several cases caused by almost incredible carelessness, as for instance the use of a barrel originally containing litharge, and in another case a red-lead keg, for the making of wine.

Very recently a report appeared in a Canadian journal[149] of six severe cases of lead poisoning in alcoholic addicts who made a practice of drinking "canned heat." The poisoning was caused, not by the original fractions of the mixture, but by contamination of the contents by lead going into solution from the containers.

POISONING from lead in food is of rare occurrence. The possibility that it might result from the use of lead in insecticides has occasioned much concern but only two cases have appeared in the literature in which the poisoning was attributed to this source.[20,142] Serious epidemics occurred repeatedly in the past from contamination of flour caused by mending broken millstones with lead; although this practice has been discontinued in general, three such epidemics have been reported recently in Austria, Italy and Spain.[9,26,30] An epidemic in Brest in 1925 was traced to a bakery where the wood used for heating the oven was obtained by breaking up old boats and was heavily covered with paint.[12] No further accounts of mass poisonings from such a source have appeared but an occasional case has come to light; for example, that of a workman who was in the habit of baking potatoes for his lunch in a minium-dehydrating oven.[37] One of the rare examples of what would seem to be the deliberate use of lead as an adulterant of food was reported in Bulgaria in 1926, where red lead in red pepper caused many cases of poisoning.[90,93]

Cooking utensils with a high lead content, a constant source of poisoning in former years, still cause trouble occasionally, earthenware vessels finished with a lead-containing glaze being the chief offenders.[3,75,101] In Germany during the World War, when copper kettles were confiscated, wide-spread poisoning was caused by plum jam cooked in enameled vessels.[68] Reports come from the Orient of poisoning from the use of copper or brass cooking utensils lined with a heavily alloyed tin[113] and from the use of a low-grade pewter, particularly for wine-pots.[149,150] Poisoning has been caused by lead in a grill and also in a spoon,[21] and again by a spoon in which lead had been melted.[112]

That lead in snuff could cause poisoning was discovered more than a century and a half ago but in spite of this fact cases, sometimes ending fatally, continue to be reported.[6,7,74,107,130,146] The source of the contamination has been found to be lead compounds, particularly lead chromate, used to improve the color, and lead in the foil wrappers. The question has been raised recently however whether lead arsenate sprayed on the tobacco plants might not be a contributory factor. A search of the literature has revealed only one case in which poisoning was attributed to lead in smoking tobacco,[144] and experiments have shown that even if lead were present, a very small proportion would be carried over into the smoke and inhaled, since most of it would remain in the ash and tar as Pb and PbO.[19] Cassil and Smith,[22] of the Division of Insecticide Investigations, U. S. Department of Agriculture, found from 3.5 to 85 p.p.m. of lead in samples of chewing tobacco and from 12 to 131 p.p.m. in snuff, the probable source being lead arsenate used to dust the tobacco plants. Zeidler and Wagner[152] found an average content of 22 p.p.m. lead in Canadian cigarets as compared with an average of less than 2.5 p.p.m. in those made from pure oriental tobaccos. The question of lead in tobacco has been reviewed in a recent number of the Journal of the American Medical Association.[63]

Poisoning in infants was reported frequently by the older writers, from the application of lead-containing ointments to the child's skin or to the mother's breast, and also from the use of lead nipple-shields. Poisoning resulting from these practices has almost disappeared; however nipple-shields still cause an occasional case[5,18,83,103,139] and two reports of poisoning from ointment applied to the mother's breast have been made fairly recently.[95,120] Lead in toys and in paint used on toys and household articles was also responsible, formerly, for many cases of poisoning in small children, and in spite of a vigorous campaign waged against this practice, poisoning from these sources still occurs.[11,40,43,80,82,106,108,122,125]

A high incidence of lead poisoning among the children in certain parts of Australia has been attributed to the ingestion of dried lead paint from verandahs of houses exposed to hot sunshine.[13,25,29,36,42,47,79,81,96,102,115,129] Widespread poisoning of nurslings in Japan and other countries in

the Orient was found to be caused by powders containing large quantities of white lead which the mothers used on their faces, necks and breasts and on the infants themselves.[8,24,39,46,51,57,58,65,66,71,72,-94,123,135,151]

OCCUPATIONS which seemingly are safe sometimes carry a hazard because of an unsuspected exposure to lead. For instance, lead encephalopathy developed in a stagehand who had been working for nine years in Viennese theaters, handling sets, transporting them, hanging them, rolling them, etc., and it was found that the paints most used in making stage drops, particularly the yellow colors, consisted of lead chromate and contained 67% lead. When, subsequently, 253 stagehands were examined, 32 were found to have a lead line and some revealed weakness of the extensors, but no other clinical cases of poisoning were discovered.[1a] Again, dust from lead-lined tea boxes caused poisoning in a man who for 26 years had emptied them, collected the lead and packed it.[118] In another case the patient had collected, sorted and packed bullets reclaimed from rifle butts,[111] and in yet another "had been employed for 17 years as scorekeeper in a poorly ventilated rifle shooting gallery; the lead bullets, striking against the iron plate behind the target, where he stood, raised considerable lead dust."[145]

Lead poisoning was the diagnosis, also, in a day-laborer who had always worked in the country and at the time was employed at digging sand in the garden.[1b] Inquiry disclosed that a shooting butt for testing fire-arms had formerly been in the garden, that it had been used for many years, and that the sand was full of fragments of lead from the bullets. Sand from Mechernich, a place in the Eifel district well known for its lead smelting works, was used to remove rust from iron girders. Three cases of poisoning occurred in men using the sand, the symptoms appearing within 14 days, and analysis showed in a sample of unused sand 3.2% of lead, in used sand 0.95%.[137]

Lead poisoning has been reported twice in golf professionals.[32,148] Davis writes: "The occupation of golf professionals does not seem, at first glance, to carry with it a risk of lead poisoning. It has, however, a dangerous side-line in the practice, which is common among professionals and their helpers, of repainting used golf balls for re-sale as practice balls. The method employed involves unusual exposure since the painter uses no brush but merely takes a handful of white lead paint and works it into the uneven surface of the ball by rotating the latter between the palms."

Another surprising case connected with the patient's profession was discovered in the criminal identification bureau of the police department in Copenhagen.[97] For many years, when examining articles for finger prints an employee had dusted them with large amounts of finely pulverized white lead and had then brushed the lead away and bent over them to detect possible prints.

Lipkovitch[78] pointed out a potential source of occupational lead poisoning. In a new model of a standard make of typewriter a felt cushion with which the keys made contact had been replaced by a fabric bag filled with lead. The dust beneath the typewriter contained 57% lead by weight, and air at the level of the typist's mouth contained from 0.15 to 0.19 mg. lead per cubic meter. Lead dust was detected also on the typists' hands at the end of the day's work. The incidence of symptoms which might be attributable to lead poisoning was higher in this group than in control groups, but no clinical cases of poisoning were found.

An occupation may have no inherent lead hazard but poisoning may result from careless practices. Thus two cases have been reported in artists who were in the habit of moistening their brushes in their mouths,[27,92] and another in a workman who held nails in his mouth.[117] Berkesy[10] tells of a railway-car packer who always kept in the same pockets the lead slugs he used in nailing up the loaded cars, the knife with which he ate bread and bacon, and even portions of his lunch. Almost incredible carelessness was responsible for poisoning in the case of a barber who for years used a lead rod to smooth his razor-stop and had formed the habit of licking the dust off the rod.[121]

Lead seems formerly to have been a frequent component of cosmetic preparations but only sporadic cases of poisoning from this source are reported now. Recently illness in an English actress was traced to a theatrical grease paint with a high lead content;[4] two cases occurred in this country, one from lead in hair dye,[114] the other from an "enamel face cream";[147] two cases from hair dye were reported in Italy,[16,99] and a similar case in France.[131] In the Orient lead-containing face powders seem still to be used extensively and have caused poisoning in adults[49,55,118] as well as the meningitis in infants mentioned above.

Lead seems also to have played quite a role as a pharmaceutical agent in earlier days. Thompson[126] has written an interesting review of Goulard's "Treatise on Effects and Various Preparations of Lead—Particularly of Extract of Saturn—for Different Chirurgical Disorders," published in 1766, which extols the virtues of lead, especially for external application. According to Tanquerel des Planches,[124b] it was used internally as well and he cites various instances in which it caused colic. Bush,[17] writing in Cincinnati in 1831, reported a "case of pulmonary disease threatening phthisis, relieved by the supervention of colica pictorum, in consequence of drinking cider impregnated with lead." This was unpremeditated therapy but other articles of the same period indicate that lead treatment of tuberculosis had a fairly extensive vogue. Reports of poisoning from lead used as a medicine are very rare now, of course, but a strong solution of lead acetate used for ivy poisoning has had such an effect,[83] and very recently a case of encephalopathy caused by lead and opium pills has been reported.[41]

The use of lead as an abortifacient seems to date from antiquity[77b] and in this capacity it must always have caused poisoning. That it is still so used and that it continues to cause poisoning is

attested by an occasional case-report.[14,15,23,45,48,56,64,-100,104,105,109,132,136]

WHETHER or not lead poisoning may result from absorption of lead from bullets or fragments of missiles retained in the body has long been a moot question. Shortly before the World War, Lewin[77a] called the attention of the medical world to this possibility, and interest in the question was revived, naturally, following the war. As a result many such cases have been reported. A careful review made recently by Machle[84] reveals, however, that when the reported cases are subjected to critical examination the diagnosis of lead poisoning from retained missiles can rarely be confirmed.

Although in the Middle Ages lead sometimes served as a means of poisoning one's enemies,[77c] such a use is rarely made of it now. White lead was the agent employed in a case occurring in Germany,[38,67] and lead arsenic was used in two cases reported in Australia.[98]

In 1933, widespread lead poisoning occurring in indigent families in Baltimore was traced to the use of discarded battery casings for fuel;[143] fumes from this wood, pouring out into the poorly ventilated houses, contained sufficient lead to cause serious and even fatal illness. Similar cases were observed later in Nashville[31] and Chicago,[76] two cases have been reported very recently in Kentucky,[44] and it is feared that this source of poisoning has not yet been eliminated in our large cities.

Lead poisoning of unusual etiology occurs in animals as well as in man. The ingestion of shot by wild fowl has become a serious problem.[33,61,85,127,138] The birds feed in "duck holes" at the bottom of lakes and dig down into the mud and silt which, in long-used shooting grounds, contains shot in considerable quantities. According to Henning,[50] cows too have swallowed lead bullets and been poisoned while grazing in the vicinity of a rifle range. The same author described poisoning in horses which had been exercised on a course covered with sand containing appreciable quantities of lead oxide.

Among the bizarre causes of lead poisoning which have come to light, two reports from the Orient may be mentioned. Yang, Chang and Liu[150] write: "It is common when a person is ill in China for him to go to or call in a taoist priest, who writes a charm on a paper, burns it, and gives the ash to the patient to be swallowed. Sometimes, as in two cases recorded here, the writing is in red pigment which, on analysis, was found to be pure lead oxide. And again, a unique case is reported from India;[28] a convict used a lead disc in an attempt to form an esophageal invagination in which to hide his treaures but by mistake swallowed the disc, which lodged in his stomach and poisoned him.

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Industrial Conference

Reported by

C. O. SAPPINGTON, M.D., DR.P.H.

THE annual Industrial Conference sponsored by the Illinois Industrial Council was held at the Lawsonia Hotel, Green Lake, Wisconsin, Thursday, August 22, and Friday, August 23, 1940.

As a feature of the opening session at 9:30 A.M. on Thursday, August 22, there was a symposium on "Selecting and Retaining Competent Personnel." Presiding at this session was ROBERT I. PIERCE, Manufacturers' Association of Chicago Heights, President, Illinois Industrial Council.

Participating in the symposium were EUGENE BENGE, Management Engineer, Chicago, on the subject "Pre-Employment Tests;" C. O. SAPPINGTON, M.D., DR.P.H., Consulting Medical Industrial Hygienist, Chicago, on the subject "Industrial Hygiene;" DR. CHRISTIAN A. RUCKMICK, of Chicago, on the subject "Putting Psychology to Work in Industry;" and WILLIAM E. ODOM, of the William Odom Associates, Management Engineers, of Chicago, on the subject "Coordinating the Work of Specialists in the Field of Labor Relations."

The discussion leaders in this group were E. C. XANDER, Tri-City Manufacturers' Association, and JAMES L. WALKER, Fox River Valley Manufacturers' Association and former President of the Illinois Industrial Conference.

It was the sense of the symposium that industrial health supervision, although widely discussed and written about, has not yet been applied to any great degree in the various industrial organizations of the country; that medical departments as such in industry today restrict themselves almost entirely to curative measures in the practice of medicine and surgery, which do not involve to any extent the procedures necessary for an adequate program of health supervision. The role of the industrial hygienist in providing scientific data with respect to working conditions was especially emphasized and the use of the industrial hygienist in association with the plant physicians was stressed. The necessity for the industrial physician using methods and policies designed for the prevention of disease and the promotion of health rather than restricting his work to curative and rehabilitation procedures, was pointed out, especially with respect to the objective of keeping employees in as good health as possible, thus enhancing the possibility of improved production both in quality and quantity.

"Overcoming Skilled Labor Shortages" as a panel discussion then followed, the members of the panel being HOMER D. SAYER, Commissioner, National Metal Trades Association; C. Q. WRIGHT, Vice-President, Whiting Corporation, Harvey, Illinois; C. A. BELL, Director of Vocational Education, Springfield; JAMES L. WALKER, Fox River Valley Manufacturers' Association. The discussion leaders were E. C. XANDER of the Tri-City Manufacturers' Association, and L. E. ROARK, Peoria Manufacturers' and Merchants' Association. The subjects discussed in this panel group were "Apprentice Training" — "Intensive Training of Skilled and Semi-Skilled Workers" — "Vocational Education" — "What an Industrial or Commercial Association Can Do to Increase the Supply of Skilled Workers."

"National Defense" concluded the August 22 session as a panel discussion, the members being: Chairman, GEORGE R. MEYERCORD, Haskalite Manufacturing Corp.; COLONEL DONALD ARMSTRONG, Chicago Ordnance District, U. S. Army; WILLIAM S. DEVEREAUX, Federal Bureau of Investigation; B. C. HEACOCK, President, Caterpillar Tractor Company; STERLING MORTON, Morton Salt Company; DAVID R. CLARKE, Fyffe and Clarke, General Counsel for the Illinois Manufacturers' Association. The discussion leaders of this panel were G. ROBERT GALLOWAY, Chamber of Commerce of Waukegan-North Chicago; R. W. JONES, Will County Manufacturers' Association, and T. W. BUTLER, Alton District Manufacturers' Association.

The subjects of the panel on "National Defense" were as follows: "The Procurement of Ordnance, Materials and Supplies" — "Protection Against Subversive Activities" — "Business Program for National Defense" — "Economic and Social Problems Involved in Current International Relations" — "Laws and Pending Legislation Relating to National Defense" — and "Governmental Contracts."

The Friday, August 23, session contained four panel groups, with RICHARD W. JONES, of the Will County Manufacturers' Association, presiding.

"Legislation — State and Federal" was discussed by JAMES L. DONNELLY, Executive Vice-President of the Illinois Manufacturers' Association, and ALLAN T. GORDON, Legislative Director of the Illinois Manufacturers' Association, under the following headings: "Legislation Affecting Industry Pending in the Federal Congress" — "Legislation Affecting Industry Expected to be Considered at the Oncoming Session of the Federal Congress" — "Legislation Affecting Industry Expected to be Considered at the Oncoming Session of the Illinois General Assembly" — "Records of Candidates for the Legislature and for Congress" — "Opportunities for Effective Cooperation." The discussion leaders for this panel were Ross BOWLES, East Side Associated Industries, and O. M. BENSON, Illinois Valley Manufacturers' Club.

The members of the second panel on "Current Problems Under Existing Laws" were: Chairman, O. M. BENSON, Illinois Valley Manufacturers'

Club; W. J. MacPherson, Chairman, Unemployment Compensation Committee of the Illinois Manufacturers' Association; John H. Doesburg, Counsel, R. R. Donnelly & Sons Co., and John Harrington, Fyffe and Clarke, Associate Counsel for the Illinois Manufacturers' Association. They discussed: "Illinois Unemployment Compensation Act" — "Illinois Occupational Retail Sales Tax" — "Federal Wage and Hour Law" — "Walsh-Healey Act" — "The Hatch Act" — and "Miscellaneous Laws Affecting Industry." The discussion leaders for this panel were G. W. Hoelscher, East Side Manufacturers' Association, and Allan T. Gordon, Legislative Director, Illinois Manufacturers' Association.

The third panel discussion was on the subject "Public Relations," with the following members participating: Chairman, Robert L. Pierce, Manufacturers' Association of Chicago Heights; Homer J. Buckley, President, Buckley, Dement & Company; C. W. Berquist, Director of Public Relations, Western Electric Company; J. F. Stiles, Jr., Abbott Laboratories, and L. E. Roark, Peoria Manufacturers' and Merchants Association. Subjects discussed were: "Industrial Executives and Public Affairs" — "Presenting Industry's Viewpoint to the Public" — "Community Educational Programs" — "Opportunities for Service by Industrial Association Executives in the Field of Public Relations" — "Winning and Retaining Public Good Will." The discussion leaders were: G. W. Hoelscher, East Side Manufacturers' Association; Thomas W. Butler, Alton District Manufacturers' Association, and Fred G. Austin, East Side Associated Industries.

The final feature of the conference was an "Information Please?" session on "Industrial Relations," conducted by David R. Clarke. Among the problems discussed at this session were: "New Developments in Collective Bargaining Procedure" — "What About Signed Contracts?" — "What About Employer's Freedom of Speech?" — "What About Court Review of Labor Board Decisions?" — "The Adoption of a Labor Policy" — "The Foreman and His Responsibilities" — "Grievances and Their Handling" — "Information to Employees."

New York Central Surgeons

THE Seventeenth Annual Meeting of the Association of Surgeons of the New York Central System will be held at the Biltmore, New York City, on Tuesday, Wednesday and Thursday, September 24, 25 and 26, 1940. Following is the Program:

Tuesday, September 24

8:30 A.M.—Registration and Information Bureau, Fountain Court, Nineteenth Floor, the Biltmore.

10:00 A.M. to 12:00 M.—General Meeting, Ballroom, Nineteenth Floor.

1. "Prognostic Factors in Circulatory Disease" — Dr. William W. Herrick.
2. "Analysis of One Thousand Deaths among Railroad Employees Subject to Periodic Examination" — Dr. George P. Myers.
3. Presidential Address — Dr. John L. Hazen.

1:30 P.M.—Golf Tournament — Siwanoy Country Club, Bronxville, New York.

Wednesday, September 25

9:30 A.M. to 12:30 P.M.—General Meeting, Music Room, First Floor.

1. "Shock: Blood Studies as a Guide to Therapy" (colored film) — Dr. John Scudder.
2. "Fluids and Electrolytes in Surgical Patients" — Dr. Samuel Standard.
3. "A Consideration of Mortality in Gall-Bladder Disease" — Dr. Charles G. Heyd.
4. "Trauma — Its Relation to Malignant Disease" Dr. James Ewing.
5. "Arachnoiditis and Nerve Atrophy in the Spinal Canal" (colored film) — Dr. Frederick Geib.

9:30 A.M. to 12:30 P.M.—Meeting for Oculist members only in Room 101 and 103 on the first floor of the Hotel. Dr. Clyde E. McDannald, Chairman.

6:30 P.M.—General Reception for members and their ladies in the Fountain Court, immediately adjacent to the Ballroom, nineteenth floor.

7:30 P.M.—Annual Dinner in the Ballroom on the nineteenth floor. Mr. Oliver G. Browne, General Claims Attorney, Toastmaster. Mr. Samuel B. Pettengill, former member of Congress (Indiana), Speaker. Distribution of golf prizes. Music and dancing until midnight.

Thursday, September 26

9:30 A.M. to 12:30 P.M.—General Meeting, Music Room, First Floor.

1. "Ambulatory Treatment of Fracture of Neck of Humerus" — Dr. John R. Cobb.
2. "Fractures about the Elbow" — Dr. Theodore C. Thompson.
3. "Recurrent Dislocation of the Shoulder" — Dr. Toufik Nicola.
4. "The Problem of the Low Back" — Dr. Ernest E. Myers.
5. "Indications and Limitations of Physiotherapy in Railroad Injuries" — Dr. Kristian G. Hansson.

Georgia Industrial Surgeons

FOLLOWING is the Program of the Third Annual Meeting of the Georgia Association of Industrial Surgeons, to be held at the Ansley Hotel, Atlanta, Georgia, on Wednesday, September 25, 1940. In addition to the papers listed, another will be presented by Dr. Lloyd Noland, of Birmingham, Alabama. Also Dr. McIver Woody, of New York, will discuss the subject: "Industrial Medicine as a Specialty."

Wednesday, September 25, 1940

Invocation: Dr. Louie D. Newton, Atlanta.
Address of Welcome: Dr. R. E. Newberry, Atlanta.
Response: Dr. C. F. Holton, Savannah, Georgia.
Address: Dr. Job C. Patterson, President Medical Association of Georgia.
"History of Fractures" — Dr. Frank K. Boland, Atlanta. Discussion open by Dr. Lester Harbin, Rome, Georgia.
"Gas Gangrene, Plea for Better Prophylaxis" — Drs. Edward C. Holmblad and Kenneth L. Matson, Railway Express Agency, Inc., Chicago.
"Chest Surgery" — Dr. C. D. Whelchel, Gainesville, Georgia. Discussion opened by Dr. Dan C. Elkin, Atlanta.
"Eye Injuries in Industry" — Dr. B. H. Minchew, Waycross, Georgia. Discussion, led by Dr. James H. Crawford, Atlanta.
"Occupational Dermatoses" — Dr. S. F. Rosen, Savannah, Georgia. Discussion, led by Dr. Philip H. Nippert, Atlanta.
"Herniae" — Dr. W. Whatley Battey, Augusta,

Georgia. Discussion, led by DR. H. M. MICHEL, Augusta.

"Industry's Expectations of Doctor, Insurance Carriers and Industrial Board in the Handling of Industrial Cases" — by a leader in industry.

"Insurance's Problems in Compensation Cases" — by an insurance official.

"What the Injured Workmen Expects of the Doctor, his Employer, the Insurance Carrier and the Industrial Board" — by some foreman of labor, or workman.

At 2:00 P.M. Luncheon, and Round Table discussions, with members of Industrial Board of Georgia. Address of President R. L. RHODES, on "Industrial Medicine." DRS. J. C. REID and F. C. MIMS, Atlanta, will lead discussions. Address by a member of the Industrial Board on the details of their investigations and work, and disclosing some of their problems.

American Railway Surgeons

THE AMERICAN ASSOCIATION OF RAILWAY SURGEONS will hold its Fifty-First Annual Meeting at the Palmer House, Chicago, on September 16, 17, and 18, 1940, with the following Program:

American Association of Railway Surgeons

FIFTY-FIRST ANNUAL MEETING,

September 16, 17, 18, 1940

Monday, September 16

9:00—10:00 A.M.—Registration—Visiting Exhibits.

10:00—"Railroad Surgeons' Records and Reports"—DR. RAYMOND HOUSEHOLDER, Ass't. to Chief Surgeon, C. M. St. P. & P. R., Chicago.

10:20—"Fractures of Metacarpals and Phalanges"—DR. RAYMOND W. MCNEALY, Assoc. Prof. Surg., Northwestern Univ., Chicago.

10:40—"Local Use of Sulfanilamide in Compound Fractures and Other Wounds"—DR. J. ALBERT KEY, Prof. Clin. Orth. Surg., Washington Univ., St. Louis, and DR. JOS. A. LEMBECK, St. Louis.

11:00—11:30 A.M.—Intermission to Review Exhibits.

11:30—"Chest Injuries"—DR. CASPER F. HEGNER, Prof. of Surg., Univ. of Colorado, Denver.

11:50—"Head Injuries"—DR. HAROLD C. VORIS, Clin. Prof. of Surg., Loyola Univ., Chicago.

12:10—2:00 P.M.—Noon Intermission.

2:00—"Plastic Surgery and Repair"—DR. MICHAEL L. MASON, Assoc. Prof. Surg., Northwestern Univ., Chicago.

2:20—"Tumors of the Head, Face and Neck"—DR. JOHN A. WOLFER, Assoc. Prof. Surg., Northwestern Univ., Chicago.

2:40—"The Significance of Hypertension and its Treatment"—DR. M. HERBERT BARKER, Ass't. Prof., Med., Northwestern Univ., Chicago.

3:00—3:30 P.M.—Intermission to Review Exhibits.

3:30—"Profits from Poor Results in Fracture Treatment."—DR. R. J. DEMOTTE, Chief Surgeon of Pullman-Standard Car Mfg. Co., Chicago.

3:50—"Gas Gangrene, Plea for Better Prophylaxsis"—DRS. EDWARD C. HOLMBLAD and KENNETH L. MATSON, Railway Express Agency, Inc., Chicago.

4:10—"The Clinical and Physiological Aspects of Human Serum Transfusions"—DRS. SIDNEY O. LEVINSON, FRANK E. RUBOVITS, H. NECHELES, from Samuel Deutsch Convalescent Serum Center, Michael Reese Hospital, Chicago.

Tuesday, September 17

9:00—10:00 A.M.—Registration—Visiting Exhibits.

10:00—"The Obstructive Prostate and its Management"—DR. FRANK M. PHIFER and DR. GEORGE A. INGRISH, Urologists, Illinois Central System, Chicago.

10:20—"Gastroscopy as an Aid in the Differential Diagnosis of Gastric Diseases"—DR. LEO. L. HARDT, Cons. Gastroscopist, Illinois Central System, Chicago.

10:40—"Hernia"—DR. JOS. F. PRINZING, Ass't. Prof. Surg., Univ. of Colorado, Denver.

11:00—11:30 A.M.—Intermission to Review Exhibits.

11:30—"Occupational Leukoderma" — DR. EDWARD A. OLIVER, Prof. Derm., Northwestern Univ., Chicago, and DRS. LOUIS SCHWARTZ and LEON H. WARREN, U. S. Public Health Service.

11:50—"Reflex Causes for Anginal Pains"—DR. NEWELL C. GILBERT, Prof. Med., Northwestern Univ., Chicago.

12:10—2:00 P.M.—Noon Intermission.

2:00—"Surgical Treatment for Carcinoma" — DR. R. KENNEDY GILCHRIST, Dept. of Surgery, Rush Medical, Chicago.

2:20—"Empyema"—DR. ALBERT H. MONTGOMERY, Clin. Prof. Surg., Rush Medical, Chicago.

2:40—"Some End Results after Injuries about the Hip Joint"—DR. KELLOGG SPEED, Clin. Prof. Surg., Rush Medical, Chicago.

3:00—3:30 P.M.—Intermission to Review Exhibits.

3:30—"The Problems of the Local Railroad Surgeon"—DR. EARLE G. JOHNSON, Co. Surg., Union Pacific R. R., Grand Island, Nebraska.

3:50—"Tick Fevers"—DR. JOHN D. SHINGLE, Co. Surg., Union Pacific R. R., Cheyenne, Wyoming.

4:10—"Evolution of Blood Transfusion"—DR. LEO M. ZIMMERMAN, Ass't. Prof. Surg., Northwestern Univ., Chicago.

Tuesday Evening

7:00—BANQUET: Toastmaster, DR. L. A. ENSMINGER, President, AMERICAN ASSOCIATION OF RAILWAY SURGEONS, Indianapolis, Indiana.
Speaker, W. M. JEFFERS, President, Union Pacific Railroad, Omaha.
Subject, "Importance of a Medical Department in Industry."

Wednesday, September 18

9:00—10:00 A.M.—Registration—Visiting Exhibits.

10:00—"Value of the Use of Morphine-Scopolamin Anesthesia in First Aid Treatment of the Injured"—DR. JAMES F. DEPREE, Ass't. to Chief Surgeon, C. M. St. P. & P. R. R., Chicago.

10:20—"Recent Developments in Gastric Physiology"—DR. ANDREW C. IVY, Prof. Physiol., Northwestern University, Chicago.

10:40—"The Diagnosis and Treatment of Neurosurgical Lesions Producing Pain in the Back"—DR. LOYAL DAVIS, Prof. Surg., Northwestern University, Chicago.

11:00—11:30 A.M.—Intermission to Review Exhibits.

11:30—"Conservative Surgery in Hydronephrosis"—DR. VINCENT J. O'CONOR, Assoc. Prof. Urol., University of Illinois, Chicago.

11:50—"Surgery of the Gastro-intestinal Tract" — DR. WALTER E. LEE, Prof. Surg., Post-Graduate School of Jefferson Medical College, Philadelphia, Pa.

12:10—2:00 P.M.—Noon Intermission.

2:00—"Shock"—DR. WM. O. MCMILLAN, Co. Surg., New York Central System, Charleston, West Virginia.

2:20—"The Recognition and Treatment of Cardiovascular Emergencies"—DR. ROBIN C. OBETZ, Co. Surgeon, New York Central System, Columbus, Ohio.

2:40—"The Reduction of Fractures with or without Anesthesia"—DR. FRANK G. MURPHY, Ass't. Prof. Orth., University of Illinois, Chicago.

3:00—"The Aging Process"—DR. HAROLD N. SEGALL, Co. Surgeon, Canadian National Railways, Montreal, Quebec.

Industrial Medicine
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The Journal of Traumatic Surgery and Occupational Diseases

Established 1932, by A. D. CLOUD

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VOLUME 9 SEPTEMBER, 1940 NUMBER 9

Lead Poisoning: A Problem

IN SPITE of great improvements in the method of control of lead exposures in industry in this country within recent years, lead and its compounds still continue to be one of the most important causes of occupational diseases, as well as one of the most important considerations as a basis for claims.

Some time ago the difficulty of the diagnosis of lead poisoning was discussed in these pages* and both engineering and medical criteria were evaluated. It was stated in this discussion that the diagnosis of lead poisoning is not as simple as it may appear and furthermore, it has since been stated that the diagnosis of industrial lead poisoning is more difficult now than it was 10 years ago. There are several reasons for this: (1) a great deal more is known about the nature and extent of extra-industrial sources of lead, which must be ruled out in the etiological application of industrial environment; and (2) although modern procedures in the evaluation of the etiology and the making of diagnoses are available, too often the engineer and the physician neglect to make intelligent use of them — the engineer is often content with routine industrial inspections rather than industrial hygiene studies, and the physician likewise is more often satisfied with purely medical diagnostic methods, without any attempted correlation of the industrial etiology.

It should be pointed out that in the majority of instances, the type of poisoning is that of a mild chronic disturbance, accompanied by little or no physical disability, although serious cases do occur; furthermore, that mere exposure to lead and its compounds is not etiological proof of an exposure that could produce lead poisoning — scientific industrial hygiene investigations are necessary to produce evidence connecting disease and disability with employment.

The article on "Lead Poisoning from Unusual Causes" (p. 471) by NELL CONWAY, of the Kettering Laboratory of Applied Physiology, is therefore very timely and the statement: "Today the ordinary lead hazards are well known, particularly those encountered in industry, but a careful perusal of the literature reveals unrecognized hazards in unexpected places and under unusual forms," is of considerable etiological and diagnostic significance.

It is heartening to know that "poisoning from lead in food is of rare occurrence." This accomplishment has come to pass largely because of the excellent research done by canning organizations and other food products manufacturers throughout the country, as well as the unparalleled work of Kehoe and his associates, especially with respect to the normal and abnormal excretion of lead in human beings, supplemented by adequate animal experiments. The establishment by the latter research group of mean values relative to the normal and abnormal excretion of lead in the urine has been a signal contribution to our knowledge on this subject. For years previous to this work, many investigators had assumed that any amount of lead in the urine was pathological — now we know much more than that.

An important source of non-industrial lead, reported both here and abroad, has been found to be associated with the consumption of home-distilled alcoholic beverages, such as wines, beer and other types of liquors. Thus Wright reported from the Industrial Clinic of the Massachusetts General Hospital that there was approximately 11% of cases of lead poisoning occurring under such circumstances over a period of a number of years, 1911-1923. In some instances, the amount of lead ran as high as 75 milligrams per liter of fluid analyzed. The lead in these instances came from the lead-containing glaze on earthenware vessels used in the preparation, ageing or storage of the beverages.

Given a suspected case of lead poisoning, the following steps are important:

1. It is the employer's responsibility to find out whether the lead exposure is of such frequency and severity that it could cause lead poisoning. Here, the industrial hygienist can not only provide the answer for the employer, but can also give valuable information for the use of the physician in his consideration of differential etiology. The information thus provided by the industrial hygiene study is of value to the employer not only in the cases to be considered, but also for the basis of prevention in future exposures, by the control or eradication of lead hazards.

INDUSTRIAL MEDICINE, Vol. 3, No. 5, pp. 304-306, May, 1934.

"Back on the job *already*, Bill?"

"Yep, didn't think I'd be working today either. Said I had a strained back at the Company Hospital. Used an electric heating machine that took all the soreness out, and quick, too. Heard the Doc say, 'Treat Bill with the Inductotherm.' Really couldn't afford a layoff now with Mary sick and all. Sure glad they had that Inductotherm."

FRIEND BILL is not unlike others in that he welcomes both a relief from pain and the elimination of any condition which might reduce his income. And those who employ the legions like Bill also strive to overcome those halts in production which ultimately increase the cost of operations. However, rules which require the employee's report of all injuries are not entirely effective since possible time loss is viewed by the worker as an "out-of-pocket" proposition. Thus, the tendency to minimize the importance of any injury which is not serious enough to be noticed by his superiors frequently produces a worker who functions at reduced efficiency. Provide a means of treating injuries quickly, however, and since "good news travels fast" you may come to expect that type of employee cooperation which brings with it a closer approach to the satisfaction of the needs of all.

To aid in this important work, the G-E Inductotherm is being ever more widely used by industry in the treatment of such conditions as bursitis, contusions, fractures, dislocations, strains, sprains, and other injuries of this nature. Operating on the principle of electromagnetic induction, the Inductotherm generates deep heat at a greater rate in vascular tissue and muscle than in skin, bone, or adipose tissue and thus localizes effective heat where it is most useful. Because Inductothermy heats tissues in proportion to their conductivity, heat is generated dominantly in vascular tissue and the excessive skin surface temperatures often associated with the ordinary condenser electrode method are avoided, speeding treatment and promoting patient comfort. Inductothermy is, therefore, *clinically valuable* since it brings about optimum results quickly and with certainty in any condition in which heat is indicated.

Learn how the Inductotherm can help you reduce expensive operating delays by permitting you to keep more men working — more of the time. For full details, write today for your copy of Pub. C79.

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2. It is likewise the responsibility of the employer to find out whether the suspected case of lead poisoning is real or merely alleged. It is here that reliance must be placed upon the diagnostic acumen of the physician who as mentioned, must cooperate intelligently with the industrial hygienist in working out the etiology. Non-industrial sources of lead must be considered so that the responsibility may be placed where it belongs, and in certain instances such non-industrial sources must be scientifically investigated, in order to have a clear conception of the source of the difficulty.

The physician must likewise consider the differential diagnosis, because there are many disturbances of the gastro-intestinal system, the blood, and the peripheral nervous system which are due to other causes than lead, but which may easily simulate lead poisoning.

All of this will involve money, time, effort, and patience, but the net result will be information of value, useful in attaining the objective of all industrial health work — prevention and control.

CONWAY's excellent review of ancient and modern literature provides an interesting discussion of the new and often bizarre causes of lead poisoning of non-industrial origin and deserves careful reading by every industrial physician.

INDUSTRIAL HEALTH AND DISEASE

Prophylaxis
—of the Common Cold—

H. S. MURAT, M.D.,
Chief Surgeon, Armco Hospital,
The American Rolling Mill Company,
Middletown, Ohio

SINCE the common cold causes more lost time than any other illness, an attempt was made to evaluate the various forms of prophylaxis. Not only is this problem of definite importance because of the great loss of economic efficiency which wholesale infection of a population with colds entails, but also because catarrhal inflammation of the nose, throat and upper bronchi, which accompanies the cold, prepares a site for the lodgment and multiplication of the virulent germs of influenza, pneumonia, diphtheria, streptococci and other bacteria.

For many years it has been known that persons may be immunized against different diseases by vaccination and considerable evidence[1] has been accumulated which indicates that this method may be used in the building up of resistance to the common cold.

The common pathogenic bacteria present in the posterior naso-pharynx are known to increase in virulence during the early stages of a cold and this generally accounts for the severity of symptoms and the development of complications in individuals whose resistance has been lowered by the infection. While no entirely satisfactory method for active immunization against colds has been found, the oral administration of the soluble antigenic substances derived from the associated bacteria has been shown[1] to be a means for combating the sequelae following colds and influenza.

The studies of Williams, Nevin and Gurley in 1921,[2] Shibley, Hanger and Dochez in 1926[3] and Blackburn, *et al.* in 1926-28[4] showed that the predominating bacteria in the naso-pharynx during health and disease consist of H. influenzae, Staphylococci, Streptococci, Pneumococci, M. cararrhalis and B. friedlander, consequently, the soluble antigenic substance we used in this attempt to develop active immunity to "colds" were derived from these organisms.

Some authorities conclude that the effect of these vaccines on the person is the same effect as from the use of a non-specific protein. On the other hand, many individual physicians have concluded to their own satisfaction that the subcutaneous or intracutaneous injection, or oral administration of these vaccines, definitely prevents the onset or complications of the common cold.

Dochez, *et al.*[5], on a group of infants recognized as highly susceptible to colds, concluded that there was no reduction in the number of simple colds or of respiratory infections associated with fever in the vaccinated as compared with the non-vaccinated group. There was, however, an apparent reduction in the severity of infections in the vaccinated infants as judged by the average duration of the febrile period. This was shorter by 40% in the vaccinated as compared with the unvaccinated group.

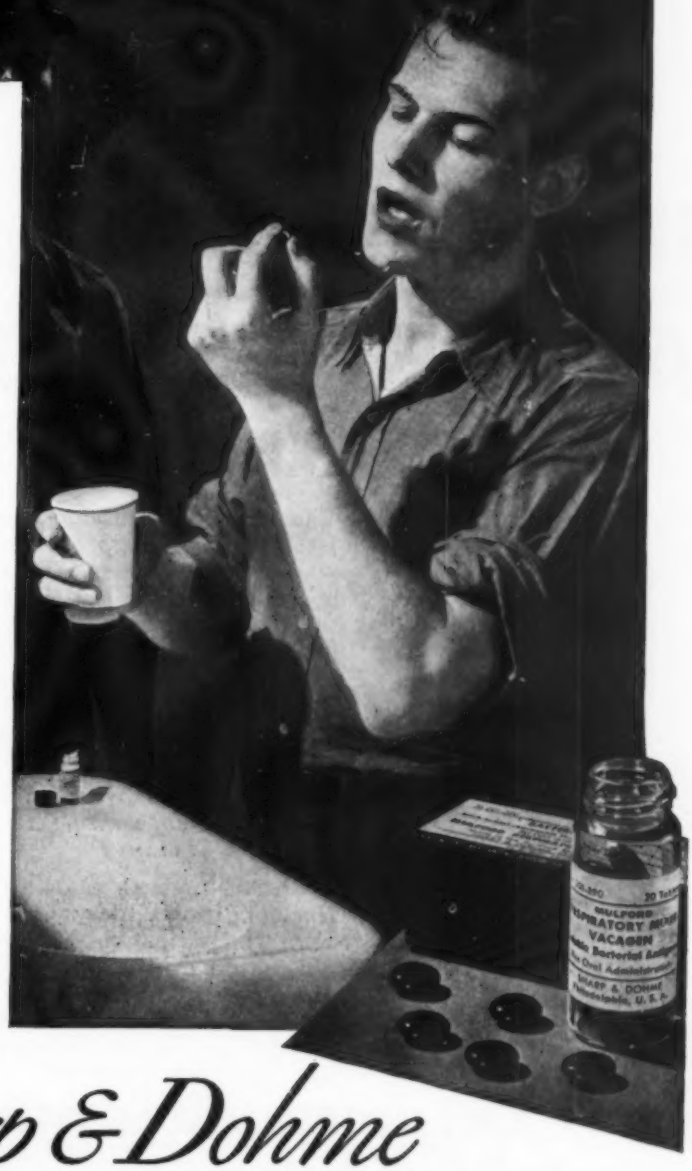
Eyre and Lowe in 1919[6] reported the results of preventive treatment during the influenza epidemic of 1918, as applied to the New Zealand Expeditionary Force in England. There were 16,014 inoculated and 5,700 uninoculated. Of the first group there was incidence of influenza of 1.3% and of the second 4.1%, with a mortality of 0.26% and 2.2% respectively.

In 1936, Thomson[7] *et al.* reported in *British Medical Journal* that a person should "once a week, throughout the winter, swallow a dose of common cold vaccine at night on an empty stomach." These physicians reported that the oral administration of the vaccine, beginning in September and continued throughout the season, protected the patient against common colds during the winter.

Diehl, Baker and Cowan[8] reporting in *J.A.M.A.* in 1938, stated that statistical analysis of the results reported for the subcutaneously administered vaccine shows that the differences reported are statistically significant and indicates that this vaccine has a definite biologic effect. A tabulation of these reports showed an average of approximately 18% less colds per person in the vaccinated group than in the control group. They found that the results with the orally administered vaccine were almost identical with those which were obtained with the subcutaneously administered vaccine. With this the average number of colds per person was 25% less for the vaccinated group than for the control group.

Piccoli[1] in 1940 reported a four-year study on 445 persons taking vaccine against 469 controls. Of the first group, 399 had 1,089 (70%) less colds than usual during the year, while the second group showed a decrease of only 299 (26.3%) colds; an essential decrease of 43.7% due to oral cold vaccine. Piccoli further studied 200 volunteer students and faculty members; 100 taking the vaccines, and 100 acting as controls. His findings confirmed the previous findings that the use of oral cold vaccines are effective in preventing colds. About 25% of the individuals studied who had taken the oral vaccine during the winter season of 1938-39 reported that they had not contracted colds at all in spite of the wide prevalence of colds the previous winter. About 70% of the individuals taking the vaccine reported a reduction of the number of colds from the average of four per individual in previous winter seasons to one or two, which were consistently reported as much milder or of shorter duration due to self-immunization with the oral vaccine. The remaining 5% reported that they did

Much of the economic loss and distress due to the COMMON COLD is preventable



THE value of mixed vaccines in the prophylactic treatment of the common cold and its complications has been stressed by many investigators. An increasingly large number of physicians who are vitally interested in the health of industrial employees are convinced that it is possible to prevent or mitigate the common cold and its complications by the use of vaccines which may be given orally or parenterally. Well-established in this field of industrial medicine are the following Mulford Biologicals:

'Vacagen' Oral Cold Vaccine Tablets For Oral Administration

'VACAGEN' ORAL COLD VACCINE TABLETS include in each tablet the soluble antigenic fractions of 60,000 million organisms representing M. catarrhalis; Pneumococcus Types 1, 2, and 3; B. friedlander; S. aureus; Streptococcus hemolytic, non-hemolytic, and viridans; and B. influenzae.

As the tablets (enteric-coated) contain only soluble bacterial derivatives, absorption in the intestinal tract is facilitated.

The dosage is one tablet with a glass of water on an empty stomach for seven successive days; then one or two tablets each week.

Bottles of 20, 100, 500 and 1,000 tablets.

Sharp & Dohme

Influenza Cold 'Serobacterin' Mixed For Parenteral Administration

INFLUENZA COLD 'SEROBACTERIN' MIXED includes recently-isolated virulent strains of M. catarrhalis; Pneumococcus Types 1, 2, and 3; B. friedlander; S. aureus; S. albus; Streptococcus hemolytic, non-hemolytic, and viridans; and B. influenzae. Catarrh Cold 'Serobacterin' Mixed is the same formula without B. influenzae.

These sensitized bacterial vaccines possess distinct advantages over plain vaccines: Due to the antigen-antibody combination, active immunity develops promptly; local and general reactions are reduced; more frequent injections and larger dosage (i.e., as to bacterial count) stimulate maximum immunity.

Supplied in individual treatment packages of four 1-cc. graduated dose vials, and in 5-cc. and 20-cc. multiple-dose vials.

N. B. Many physicians practice initial parenteral treatment with the sensitized vaccine, followed by maintenance treatment with oral vaccine.

RECORD OF COLD IMMUNIZATION TABLETS

	Number	Per Cent	Number	Per Cent
	1938–39		1939–40	
E. S. HOSPITAL				
Number taking tablet No. 1	493		393	
Number taking tablet No. 2	489		177	
Number who lost no time after taking tablet No. 1	453	37%	279	71%
Number who lost no time after taking tablet No. 2	441	24%	106	60%
Number who lost time after taking tablet No. 1	40	8%	114	28%
Number who lost time after taking tablet No. 2	48	10%	71	40%
CWKS. HOSPITAL				
Number taking tablet No. 1	154		83	
Number taking tablet No. 2	137		30	
Number who lost no time after taking tablet No. 1	153	99%	47	58%
Number who lost no time after taking tablet No. 2	133	97%	12	40%
Number who lost time after taking tablet No. 1	1	0.6%	36	43%
Number who lost time after taking tablet No. 2	4	2.9%	18	60%

not seem to be benefited at all but many of this group admitted that they had not taken the vaccine faithfully throughout the season.

Clinical Study

REALIZING that many factors may influence susceptibility to the "common cold," we decided to divide our cases into two groups. One group to receive tablet No. 1.* These tablets contain only soluble antigenic derivative of recently isolated strains of Pneumococcus Types I, II and III (Diplococcus pneumoniae), Streptococcus, (Hemolytic, non-hemolytic and viridans), Influenza bacillus (Hemophilus influenzae), M. catarrhalis (Neisseris catarrhalis), Staphylococcus aureus, and Friedlander baccillus (Klebsiella pneumoniae). The bacteria used in the preparation of this product are representative strains of bacteria, commonly associated with infections of the nose, throat and bronchial tree.

The second group to receive tablet No. 2, which appeared identical, but was a placebo containing milk sugar.

Those persons receiving tablet No. 1 the first year were gven tablet No. 2 the second year, and vice versa.

Discussion

ALTHOUGH the etiological agent of the common cold and influenza is now recognized as a virus against which no entirely satisfactory method of active immunization has as yet been developed, the common pathogenic bacteria present in the posterior nasopharynx are known to increase in virulence in the presence of influenza and the "commond cold," and account for the severity of symptoms and the development of complications in individuals whose resistance has been lowered by the virus. It is generally accepted that the common cold should be taken seriously and that if proper precautions are followed, serious consequences may be prevented. It is also known that individuals can develop resistance against certain infections by vaccination, consequently, for many years attempts have been made to immunize persons against respiratory infections. Unfortunately, there have been very few controlled studies on the use of respiratory vaccines, although within the past year there has

* "Respiratory Mixed Vacagen."

IMPORTANT:—KEEP FIGHTING
ATHLETE'S FOOT
THE YEAR 'ROUND!

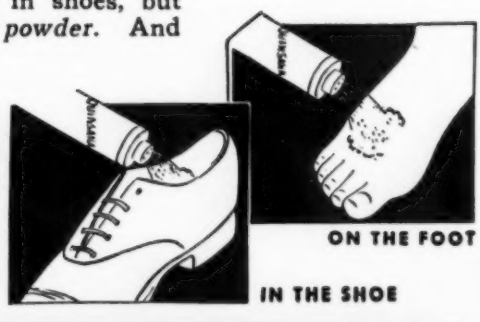
The medical profession knows that Athlete's Foot is *as prevalent in fall and winter as in summer!* This is backed up by statistical studies. The disease may take a less acute form when cooler weather comes, but the infection is just as prevalent, *should be guarded against just as closely as ever!*

Reports from dermatologists, chiropodists, clinics and others indicate that QUINSANA Powder is giving extraordinarily *successful results* against Athlete's Foot.

Quinsana creates on the skin *an alkaline condition* under which the Athlete's Foot fungus *cannot live.* The fungicidal action of the powder is made *still more potent* by the medicaments which Quinsana contains. Furthermore, this powder can be used continuously *without irritating the skin!*

2-WAY TREATMENT...FEET AND SHOES

Quinsana Powder is used two ways — (1) *on feet;* (2) *in shoes.* Ointments and liquids cannot be used conveniently in shoes, but Quinsana can, because it's a *powder.* And treatment of *shoes* (as well as *feet)* is indispensable, since the Athlete's Foot fungus thrives in shoe-linings and, unless killed there, *generally causes re-infection!*



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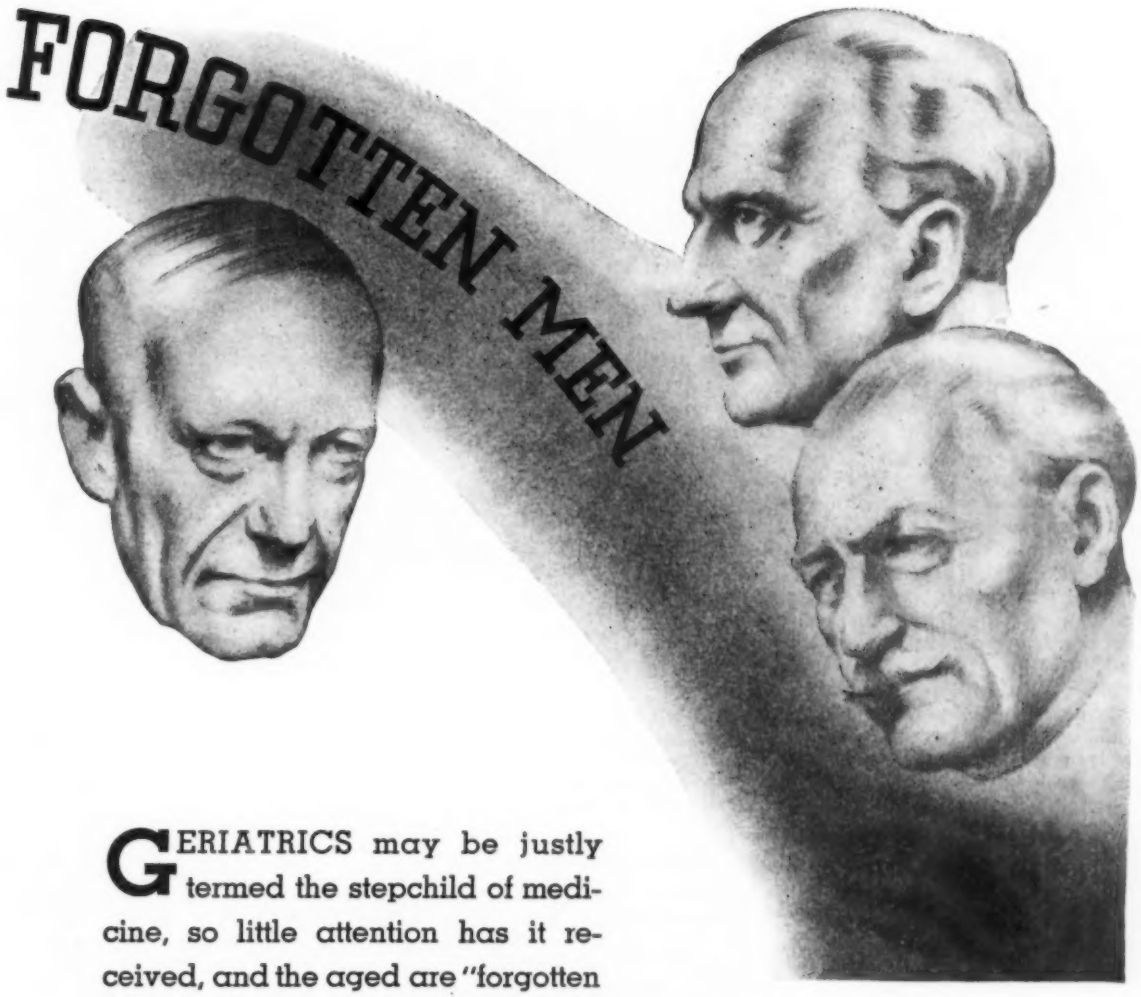

GERIATRICS may be justly termed the stepchild of medicine, so little attention has it received, and the aged are "forgotten men." Yet, medicine can provide much comfort to ease the infirmities of old age, among which constipation is almost ever present. You will find, as many physicians have already found, that Agarol is the preparation well-suited to the treatment of the obstinate constipation of advanced years. The contents of the colon are softened by unabsorbable moisture, evacuation is made easy and painless and devoid of dangerous straining. Such action is, of course, desirable not only in the aged, but in every age group. Agarol is gentle enough for the young child, yet in proper dosage active enough for the adult. A trial supply of Agarol will be gladly sent to you. It is supplied in bottles of 6, 10 and 16 ounces.

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been at least one report which will indicate that persons who have been given these vaccines have less colds than those who have not taken the vaccine.

I thas been found that persons who are taking respiratory vaccines experience a certain fullness in the naso-pharyneal mucous membrane which would indicate in an objective way some process going on in these cells. It has also been found that persons who have completed their immunization state that when they are exposed to a "cold" they may sneeze two or three times and have the sensation that they are "catching cold" but that within a few hours this sensation disappears and the cold is evidently aborted. These objectives signs of course are not conclusive but as yet there is no laboratory procedure that has been worked out that can measure the immunity that a person develops against a cold.

Although subcutaneous injections of respiratory vaccines have been used for a number of years, it has only been recently that these vaccines have been given by mouth. Laboratory work would indicate that some vaccines are readily absorbed from the intestinal tract, and consequently where a number of injections are necessary when the vaccine is given subcutaneously, as with respiratory vaccines, if these vaccines are taken orally, the method will be more acceptable to patients.

In any case, the taking of the respiratory vaccines will do no harm. They may not prevent colds in some cases, while in others, colds may be aborted, and in others, complications may be prevented or the colds may be prevented from becoming chronic.

Conclusions

A CLINICAL study on the prophylaxis of the "common cold" was carried out for two years, and involved a total of 1273 individuals. This group was divided into two parts; alternate individuals being given tablets containing a soluble antigenic derivative of the bacteria commonly found in the respiratory tract, while the other persons were given similar tablets containing an innocuous substance.

There was an apparent difference in the susceptibility to colds in favor of those taking the vaccine as against those who did not take it. There was a loss of time in 6.3% of those taking the vaccine as against 8.6% of those taking the placebo.

From these observations it would appear that with the administraiton of oral vaccine individuals may expect a certain degree of protection against the organisms commonly found in the respiratory tract, and which account for many of the complications associated with the "common cold."

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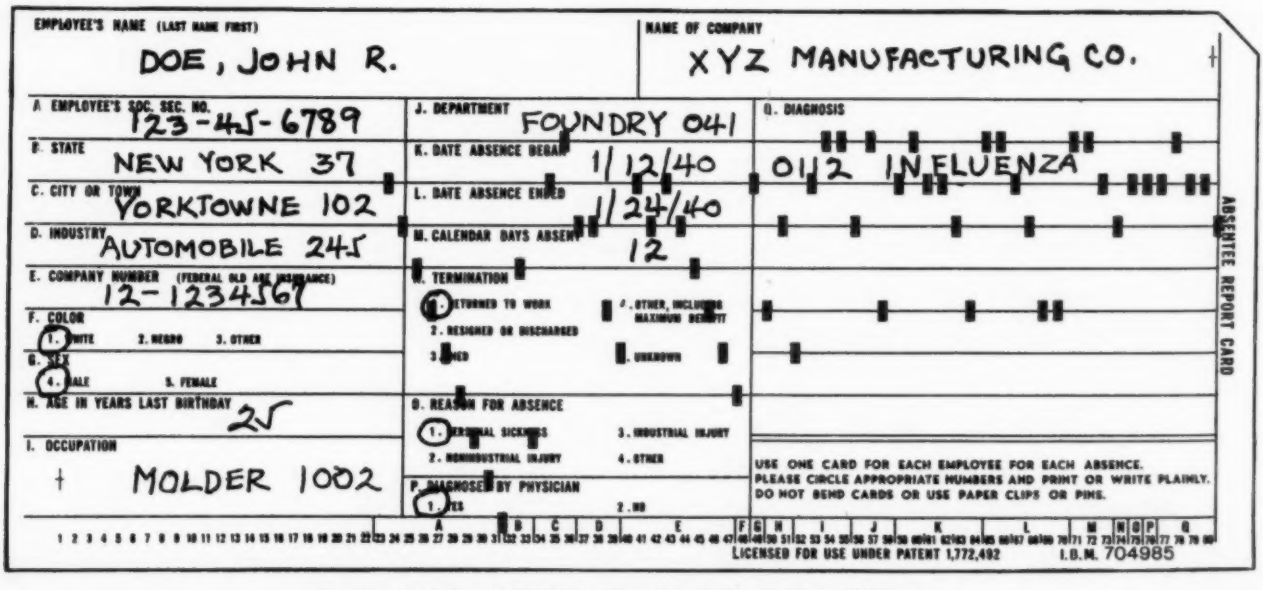
A Proposed Plan for the Recording of Industrial Absenteeism

PREPARED BY THE DIVISION OF INDUSTRIAL HYGIENE OF THE NATIONAL INSTITUTE OF HEALTH, U. S. PUBLIC HEALTH SERVICE, WASHINGTON, D. C.

"Every case of lost time or absence calls for inquiry. It should be properly recorded. A study of such records is certain to disclose the existence of adverse influences or circumstances, today unsuspected, which may denote the beginning of sickness." British Health of Munition Workers Committee. Sir George Newman, Chairman. (1916)

WHILE it is desirable that data on absences from all causes and of all durations be recorded the plan presented here is concerned principally with sickness as a cause. It is now fairly well established that the lost time and incapacity due to sickness among workers constitute one of the most important problems in industrial hygiene. Studies which have been made, both in this country and abroad, indicate that absenteeism due to sickness exceeds by far that caused by industrial injury and occupational diseases. These findings present an important social and economic problem to those concerned with the welfare of the working population.

In this country, great strides have been made in the control of occupational accidents and specific occupational diseases. Industrial hygienists at present are focusing their attention


EMPLOYEE'S NAME (LAST NAME FIRST)
DOE, JOHN R.
NAME OF COMPANY
XYZ MANUFACTURING CO.
A. EMPLOYEE'S SOC. SEC. NO. 123-45-6789
B. STATE NEW YORK 37
C. CITY OR TOWN YORKTOWNE 102
D. INDUSTRY AUTOMOBILE 245
E. COMPANY NUMBER (FEDERAL OLD AGE INSURANCE) 12-1234567
F. COLOR 1. WHITE 2. NEGRO 3. OTHER
G. SEX 4. MALE 5. FEMALE
H. AGE IN YEARS LAST BIRTHDAY 25
I. OCCUPATION MOLDER 1002
J. DEPARTMENT FOUNDRY 041
K. DATE ABSENCE BEGAN 1/12/40
L. DATE ABSENCE ENDED 1/24/40
M. CALENDAR DAYS ABSENT 12
N. TERMINATION 1. RETURNED TO WORK 2. RESIGNED OR DISCHARGED 3. DIED 4. OTHER, INCLUDING MAXIMUM BENEFIT 5. UNKNOWN
O. REASON FOR ABSENCE 1. PERSONAL SICKNESS 2. NONINDUSTRIAL INJURY 3. INDUSTRIAL INJURY 4. OTHER
P. DIAGNOSED BY PHYSICIAN 1. YES 2. NO
Q. DIAGNOSIS 0112 INFLUENZA
USE ONE CARD FOR EACH EMPLOYEE FOR EACH ABSENCE.
PLEASE CIRCLE APPROPRIATE NUMBERS AND PRINT OR WRITE PLAINLY.
DO NOT BEND CARDS OR USE PAPER CLIPS OR PINS.
ABSENTEE REPORT CARD
LICENSED FOR USE UNDER PATENT 1,772,492
I.B.M. 704985

Suggested Punch Card for the Recording of an Absence
(The card as shown is ready for the tabulating machine)

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Osmotic equilibrium established by Sal Hepatica in recommended dosage creates *liquid bulk* in the intestines. Smoothly and gently, this *liquid bulk* rids the bowel of waste by peristaltic activation, lubrication and flushing. Should gastric hyperacidity or laggard bile-flow accompany constipation, Sal Hepatica may also help by neutralization of excessive gastric acidity, and choleretic action.

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on the importance of general health among the gainfully employed. It is realized that, in order to improve the health of workers steps must be taken to prevent or control sickness among them. However, it is also realized that, before such steps can be taken, it will be necessary first to know something of the magnitude and nature of the factors involved. Such information is vitally needed as a basis for constructive development in the field of industrial hygiene. It is obviously necessary that some one definite plan be adopted to insure comparability of results among different industries.

The plan as proposed requires the filling in of a punch card for each absence, and the recording on two forms (A and B) of the number of workers under observation. The punch card and forms are illustrated and further reference will be made to them later. The punching of the cards, the tabulation, and the analysis may be performed by the company, the State health department or some other body.

Objectives of the Proposed Plan

ABSENTEEISM records will reveal the line of action which needs to be taken to obtain a maximum reduction in the amount of time lost from work on account of disability. Excessive rates from certain causes will call for epidemiological studies and should serve to improve those conditions which may be the cause of undue amounts of disability.

In an attempt to improve the health of the worker certain statistical data should be obtained so as to yield the following basic rates:

1. Frequency Rate: Average annual number of absences per 1,000 workers.
2. Disability Rate: Average annual number of days lost per worker.
3. Severity Rate: Average number of days lost per absence.
4. Fatality Rate: Percent of cases that ended fatally.
5. Mortality Rate: Number of deaths per 1,000 workers.

With respect to absences from causes other than sickness, only rates corresponding to 1, 2, and 3 are obtainable.

All of the rates referred to should be specific for age, sex, color, department, occupation and for whatever cause.

It is especially important to obtain sickness absenteeism rates according to occupation. The incidence of pneumonia, for example, may be abnormally high for some occupations, but this condition would not necessarily be revealed were rates determined on a departmental or industry basis. Sickness rates for specific diseases in an occupation group will permit the evaluation of the effect of the working environment on health. Furthermore, such information is useful in the assessment of the efficiency of any methods which may be instituted for the control of diseases found occurring at excessive frequency. To obtain all of the rates indicated above, it is essential that the number of workers under observation (absent as well as nonabsent) be known in each occupation specific for age, sex, and color.

Material Required

THE following material is required:
(a) Punch cards for recording absences.

(b) Form A and Form B for recording the number of employees under observation. (This number includes any employee, and only such employees, for whom a punch card would be filled in should he at any time be absent.)

Care of the Punch Cards

SINCE the completed punch cards will be punched and run through delicate machinery it is most necessary that the cards be handled with extreme care. Any tear, crease or other physical blemish will interfere with the running of the card through the machines. Therefore no paper clips or pins should be used, and care should be taken not to bend the cards nor rub their edges. Rubber bands or strings should not be used without protecting the top and bottom of a pack of punch cards with card board or several thicknesses of paper. Stored cards, blank or filled in, should be kept tightly packed in their original containers, and not stored in a damp or in a hot place.

Filling in of the Punch Cards

GENERAL Instructions:
1. All entries on the cards should be written legibly, preferably with pen and ink. A typewriter should not be used since it would injure the cards.

2. One card should be made for each absence lasting one calendar day or longer provided the employee is a member of the group under observation, namely, included in the report forms A and B.

3. On the first day an employee (a member of the group under observation) is absent, the following items should be filled in on the punch card: Employee's name, name of company, Social Security number, State, City or Town, industry, Federal Old Age Insurance company number (Employer's identification number), Color, Sex, Age, Occupation, Department, and Date absence

FORM A

AVERAGE NUMBER[1] OF MALE AND FEMALE EMPLOYEES BY MONTHS

Name of company.....

Location..... (Address)

Industry.....

Year 19.....

Month	Average number of employees	
	Male	Female
January		
February		
March		
April		
May		
June		
July		
August		
September		
October		
November		
December		

1/ This number includes any employee, and only such employees, for whom a punch card would be filled in should he at any time be absent.

Signed .....

Position .....

Date .....

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Dr. .....

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NUMBER OF ALL[1] EMPLOYEES OF DIFFERENT AGES AND COLORS BY OCCUPATION AND DEPARTMENT

Name of company..... Location (address)..... Industry .....

Age distribution of employees as of....., 19..... [2]Sex.....
(Month)

Occupation	Department	All ages			Age in Years																	
					Under 25			25-34			35-44			45-54			55-64			65 and over		
		White	Negro	Other	White	Negro	Other	White	Negro	Other	White	Negro	Other	White	Negro	Other	White	Negro	Other	White	Negro	Other

1. This number includes any employee, and only such employees, for whom a punch card would be filled in should he at any time be absent.
2. Report only one sex on each sheet. Please designate whether Male or Female.

Signed..... Date.....

[1]Industrial Absenteeism, B. **FORM B** Position.....

began. The card should be completed when the employee returns to work, or the absence is terminated by death, removal from the payroll or by some other cause.

4. On the day recording begins it will be necessary to fill in a punch card as completely as possible for each employee (a member of the group under observation) who is absent on that day. At this one particular time a card should be prepared regardless of how far back the absence began, provided the employee is still on the payroll or considered an employee whether or not he is receiving pay.

Items on the Punch Card

EMPLOYEE'S NAME. — Enter last name first, followed by first name, and then middle name or initial.

NAME OF COMPANY. — Write the name of the company. (A rubber stamp could be used here and a supply of cards stamped before needed.)

(A) EMPLOYEE'S SOCIAL SECURITY NUMBER. — This number should be used because it does not change.

(B) STATE, and (C) CITY OR TOWN. — Write the name of the State and City (or Town) in which the plant or establishment is located. (If a rubber stamp is used above and it includes the State and City, or Town, these spaces may be left blank.)

(D) INDUSTRY. — State type of industry. The industrial classifications prepared under the auspices of the Central Statistical Board, Washington, D. C., are recommended for consideration.

(E) COMPANY NUMBER. — The Federal Old Age Insurance number should be used. This is also known as the Employer's Identification number.

(F) COLOR. — Circle the appropriate number.

1. White (native or foreign born).
2. Negro.
3. Other (Chinese, Japanese, Filipino, etc.).

(G) SEX. — Circle the appropriate number.

4. Male.
5. Female.

(H) AGE IN YEARS. — Give age in years at last birthday.

(I) OCCUPATION. — Enter the occupation in which the employee was engaged when the absence began. This occupation would correspond to the employee's occupation as given on Form B.

(J) DEPARTMENT. — Enter the department in which the employee was engaged when the absence began. This department would correspond to the employee's department as given on Form B.

(K) DATE ABSENCE BEGAN.—Enter the day on which the employee's absence began, for example, 5-20-40.

(L) DATE ABSENCE ENDED.—Enter the day the employee returned to work, or the absence was ended by death, being dropped from the payroll, etc., 6-3-40.

(M) CALENDAR DAYS ABSENT. — The calendar days absent is the number of calendar days from the date the absence began to the date the employee returned to work, or until termination by death or otherwise.

(N) TERMINATION. — Circle the appropriate number.

1. Returned to work.
2. Resigned or discharged,
3. Died.
4. Other, including maximum benefit.
5. Unknown.

(O) REASON FOR ABSENCE.—Circle the appropriate number.

1. Personal sickness (employee sick himself).
2. Non-industrial injury.
3. Industrial injury.
4. Other.

If the reason for absence was marked "4," P and Q of the card will be blank.

(P) DIAGNOSED BY PHYSICIAN. — Circle the appropriate number.

1. Yes.
2. No.

(Q) DIAGNOSIS. — Give the name of the disease which is the primary cause of disability. All complications, concurrent diseases and sequelae should be recorded.

In the statistical analyses the diagnoses might be classified as follows:

Non-industrial injury
Influenza and grippe
Nasal fossae and annexae
Bronchitis
Pharynx and tonsils
Pneumonia
Respiratory tuberculosis
Other respiratory diseases
Teeth and gums
Stomach except cancer
Diarrhea and enteritis
Appendicitis
Hernia
Other digestive diseases
Heart
Hemorrhoids
Other circulatory diseases
Genito-urinary diseases
Neuralgia, neuritis, sciatica
Other diseases of nervous system
Organs of vision
Ear and mastoid process
Rheumatic diseases
Lumbago, myositis, etc.
Skin diseases
Infectious and parasitic diseases
Cancer, all sites
Other nonrespiratory — nondigestive diseases
Ill-defined and unknown causes
Pregnancy
Industrial injury

Filling in Forms A and B

FORMS A and B are essential since they provide the population base upon which the various specific rates must be calculated. It is very important that they be prepared with great care and to make sure that the number of employees recorded on Forms A and B includes only such employees for whom punch cards would be filled in should they at any time be absent. Failure to observe this caution might result in a fictitious reduction in rate caused by the inclusion of more employees than were subject to absence recording.

Form A. — Average number of male and female employees by months should be filled in at the end of each recording period, including only those months comprised in that particular period. The method used to obtain the average and the source of information pertaining to the employees under observation should be selected with the objective of securing the maximum degree of accuracy. For example, if there was not a large amount of labor turnover the average is generally obtained by a count on the first and the middle of the month, which when added together and divided by 2 would give the desired result. If there was a sick benefit organization which did not include all employees, it might be necessary to make the count from the sick benefit organization records rather than from the total payroll.

Form B. — Number of employees according to age and color by occupation and department gives the data upon which specific rates can be calculated. A Form B is filled in for each sex. Since the constitution of the employed population of any particular plant is likely to remain fairly constant it is not necessary to make this detailed count at the end of each recording period; instead probably annually or semi-annually would be sufficient. During the intervening period the proportions with respect to sex, age, etc., calculated from Form B can be applied to the data on Form A. Care should be exercised that the age, color, sex, occupation and department in which an em-

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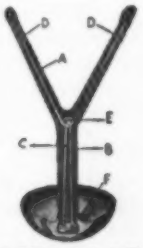

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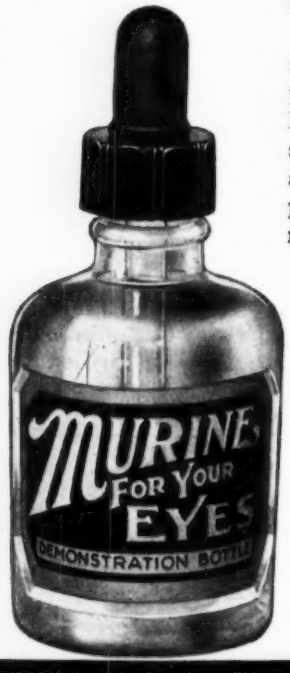

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ployee is counted on Form B should correspond with the age, color, sex, occupation and department which will be entered on the punch card if the employee be absent.

Conclusion

THIS proposed plan for the recording of absenteeism among workers is intended as a stimulus to discussion and experimentation which it is believed will lead to a standard system of recording.

Additional experience is particularly needed concerning the kind of industrial classification best adapted to absenteeism recording. The "Industrial Classification" proposed by the Central Statistical Board, Washington, D. C., should be followed in general outline, but the grouping within the broad classes will require careful study. Likewise an occupational code which will be sufficiently detailed and yet not too cumbersome has yet to be devised. In this instance also the Central Statistical Board has in preparation a code which should be of assistance. At the present time it seems desirable to describe each occupation in as complete detail as possible. For some companies a classification by department alone, without occupation, may be satisfactory. The ultimate aim, however, should be to develop an occupational code which will fit the needs of all companies.

Information in detail should be secured from each company with respect to the rules and regulations governing absences before any inter-company comparisons are made. It is important to know the coverage of reporting in each plant; whether groups of employees of certain occupations, ages, or physical conditions are excluded; whether payment is made for absences and, if so, whether this payment represents full wages or part wages; and whether there are benefits from sick benefit organization funds or sickness insurance. Not only should the scale of payments be ascertained, but also the length of time such payments are made. Methods of recording the termination of absences should be examined with the object of discovering whether arbitrary time limits are applied with the result that absence records are cut off while some individuals are still unable to work.

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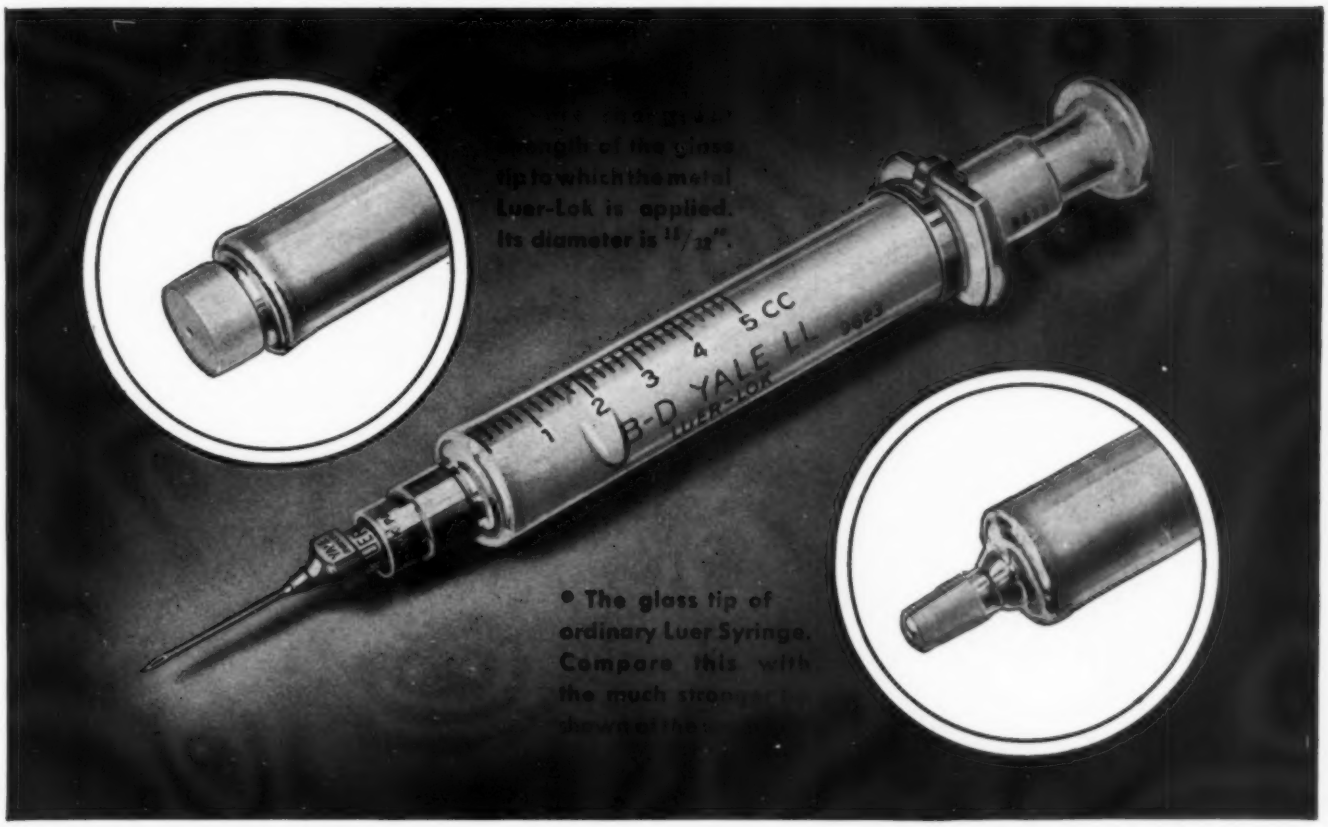
Michigan Meeting

THE meeting of the MICHIGAN SOCIETY OF INDUSTRIAL PHYSICIANS AND SURGEONS, at Detroit, September 24, 1940, will begin at 9:30 A.M. with a clinic on Traumatic and Reconstructive Surgery, at Harper Hospital; and the afternoon session, at the Book-Cadillac Hotel, at 2:00 P.M., will include a Round Table discussion on Industrial Medicine and Surgery, and Traumatic Surgery. The speakers at the Dinner, at the Book-Cadillac at 6:30 P.M. will be DR. FRANK T. MCCORMICK, President of the Society, and HARVEY CAMPBELL, Vice-President, Detroit Board of Commerce, who will speak on "The Industrial Physician and National Defense."



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